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RESOURCE CONSERVATION AND RECOVERY ACT GROUND-WATER MONITORING PROJECTS FOR HANFORD FACILITIES: PROGRESS REPORT FOR THE PERIOD JULY 1 TO SEPTEMBER 30, 1988

Volume 1 - Text

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February 1989

Prepared for
the U.S. Department of Energy
under Contract DE-AC06-76RLO 1830

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PREFACE

This is Volume 1 of a two-volume set of documents that describes the progress of 12 Hanford Site ground-water monitoring projects for the period July 1 to September 30, 1988. This volume discusses the projects; Volume 2 provides as-built diagrams, drilling logs, and geophysical logs for wells drilled during this period in the 200-East Area around the 2101-M Pond.

Although constituent concentrations are compared to federal drinking water standards throughout this document, no public water supplies are drawn from the aquifer from which the samples for this study were taken. Small quantities of water drawn from the sampled aquifer are used to supply drinking water to a limited number of workers on the Hanford Site. In such cases, that water is mixed with water from uncontaminated sources, and the drinking water delivered to the workers meets all regulatory standards.

SUMMARY

This report describes the progress of 12 Hanford ground-water monitoring projects for the period July 1 to September 30, 1988. The facilities represented by the 12 projects are the 300 Area Process Trenches, 183-H Solar Evaporation Basins, 200 Areas Low-Level Burial Grounds, Nonradioactive Dangerous Waste Landfill, 1301-N Liquid Waste Disposal Facility, 1324-N/NA Surface Impoundment and Percolation Ponds, 1325-N Liquid Waste Disposal Facility, 216-A-10 Crib, 216-A-29 Ditch, 216-A-36B Crib, 216-B-3 Pond, and the 2101-M Pond. The 216-A-10 Crib and the 216-B-3 Pond projects are included in this series of quarterly reports for the first time. This report is the ninth in a series of periodic status reports; the first eight cover the period from May 1, 1986, through June 30, 1988 (PNL 1986; 1987a,b,c,d; 1988b,c,d).

The 12 projects discussed in this report were designed according to the applicable interim-status ground-water monitoring requirements specified in the Resource Conservation and Recovery Act of 1976 as amended, and in 40 CFR 265, Subpart F, and in WAC 173-303-400.

During this quarter, field activities at the 300 Area Process Trenches, the Nonradioactive Dangerous Waste Landfill, the 183-H Solar Evaporation Basins, the 1324-N/NA Surface Impoundment and Percolation Ponds, the 1301-N and 1325-N Liquid Waste Disposal Facilities, and the 216-A-36B Crib consisted of ground-water sampling and analyses, and water-level monitoring. The 200 Area Low-Level Burial Grounds section includes well development data, sediment analyses, and water-level measurements. Ground-water sampling was begun at this site, and results will be included in next quarter's report.

Twelve new wells were installed during the quarter, two at the 216-A-29 Ditch, six at the 216-A-10 Crib, and four at the 216-B-3 Pond. Preliminary characterization data for these new wells are included in this report. Driller's logs and other drilling and site characterization data will be provided in the next quarterly report. At the 2101-M Pond, construction was completed on four wells, and initial ground-water samples were taken. The drilling logs, geophysical logging data, and as-built diagrams are included in this report in Volume 2.

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FIGURES

TABLES

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ERRATA FROM PREVIOUS REPORTS

Please make note of the following two corrections to the previous quarterly report (PNL 1988d):

- For the 1301-N section, the correct analytical summary table was inadvertently not included (instead, the 183-H analytical summary data table was repeated). The correct summary table for 1301-N analytical results for the reporting period April, May, and June 1988 is included in this errata.
- For the 216-A-36B Crib section, only partial geologists' and driller's logs for the five new wells at 216-A-36B Crib were submitted. The remaining logs are provided in Appendix A of this report.

TABLE I. Summary of Sampling Results for the 1301-N Liquid Waste Disposal Facility, March 1988

Constituent List=Contamination Indicator Parameters

Constituent Code	Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standards Standard	Agency	Exceeded	Full name
191	CONDFLD	umho	1	5	0		700	WDOE		Specific conductance, field
199	PHFIELD		0.1	5	0		8.5	EPAS		pH, field

Constituent List=Drinking Water Parameters

Constituent Code	Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standards Standard	Agency	Exceeded	Full name
109	COLIFRM	MPN	2.2	5	5	***	1	EPA		Coliform bacteria
111	BETA	pCi/L	8	5	0		50	EPA	xxx	Gross beta
181	RADIUM	pCi/L	1	5	0		5	EPA		Total radium
212	ALPHA	pCi/L	4	5	0		15	EPA		Gross alpha
A06	BARIUM	ppb	6	5	0		1000	EPA		Barium
A07	CADMIUM	ppb	2	5	5	***	10	EPA		Cadmium
A08	CHROMUM	ppb	10	5	5	***	50	EPA		Chromium
A10	SILVER	ppb	10	5	5	***	50	EPA		Silver
A20	ARSENIC	ppb	5	5	4		50	EPA		Arsenic
A21	MERCURY	ppb	0.1	5	5	***	2	EPA		Mercury
A22	SELENUM	ppb	5	5	5	***	10	EPA		Selenium
A33	ENDRIN	ppb	0.1	5	5	***	0.2	EPA		Endrin
A34	METHLOR	ppb	3	5	5	***	100	EPA		Methoxychlor
A35	TOXAENE	ppb	1	5	5	***	5	EPA		Toxaphene
A36	a-BHC	ppb	0.1	5	5	***	4	EPA		Lindane, alpha-BHC
A37	b-BHC	ppb	0.1	5	5	***	4	EPA		Lindane, beta-BHC
A38	g-BHC	ppb	0.1	5	5	***	4	EPA		Lindane, gamma-BHC
A39	d-BHC	ppb	0.1	5	5	***	4	EPA		Lindane, delta-BHC
A51	LEADGF	ppb	5	5	4		50	EPA		Lead (graphite furnace)
C72	NITRATE	ppb	500	5	0		45000	EPA	xxx	Nitrate
C74	FLUORID	ppb	500	5	4		4000	EPA		Fluoride
H13	2,4-D	ppb	2	5	5	***	100	EPA		2,4-D [2,4-Dichlorophenoxyacetic acid]
H14	2,4,5TP	ppb	2	5	5	***	10	EPA		2,4,5-TP silvex
H20	FBARIUM	ppb	6	5	0		1000	EPA		Barium, filtered
H21	FCADMIU	ppb	2	5	5	***	10	EPA		Cadmium, filtered
H22	FCHROMI	ppb	10	5	5	***	50	EPA		Chromium, filtered
H23	FSILVER	ppb	10	5	5	***	50	EPA		Silver, filtered
H37	FARSENI	ppb	5	5	4		50	EPA		Arsenic, filtered
H38	FMERCUR	ppb	0.1	5	5	***	2	EPA		Mercury, filtered
H39	FSELENI	ppb	5	5	5	***	10	EPA		Selenium, filtered
H41	FLEAD	ppb	5	5	5	***	50	EPA		Lead, filtered

TABLE I. (contd)

---------- Constituent List=Water Quality Parameters ----------

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standard	Agency	Exceeded	Full name
A11	SODIUM	ppb	200	5	0		.			Sodium
A17	MANGESE	ppb	5	5	1		50	EPAS	xxx	Manganese
A19	IRON	ppb	30	5	0		300	EPAS	xxx	Iron
C73	SULFATE	ppb	500	5	0		250000	EPAS		Sulfate
C75	CHLORID	ppb	500	5	0		250000	EPAS		Chloride
H24	FSODIUM	ppb	200	5	0		.			Sodium, filtered
H29	FMANGAN	ppb	5	5	3		50	EPAS		Manganese, filtered
H31	FIRON	ppb	30	5	4		300	EPAS		Iron, filtered

---------- Constituent List=Site Specific and Other Parameters ----------

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standard	Agency	Exceeded	Full name
A04	ZINC	ppb	5	5	0		5000	EPAS		Zinc
A05	CALCIUM	ppb	50	5	0		.			Calcium
A12	NICKEL	ppb	10	5	5	***	.			Nickel
A13	COPPER	ppb	10	5	5	***	1300	EPAP		Copper
A14	VANADUM	ppb	5	5	2		.			Vanadium
A16	ALUMNUM	ppb	150	5	3		.			Aluminum
A18	POTASUM	ppb	100	5	0		.			Potassium
A50	MAGNES	ppb	50	5	0		.			Magnesium
A61	TETRANE	ppb	5	5	5	***	5	EPA		Tetrachloromethane [Carbon Tetrachloride
A64	METHONE	ppb	10	5	5	***	.			Methyl ethyl ketone
A67	1,1,1-T	ppb	5	5	5	***	200	EPA		1,1,1-Trichloroethane
A68	1,1,2-T	ppb	5	5	5	***	.			1,1,2-Trichloroethane
A69	TRICENE	ppb	5	5	5	***	5	EPA		Trichloroethylene [1,1,2-Trichloroethene
A70	PERCENE	ppb	5	5	5	***	.			Perchloroethylene [Tetrachloroethene]
A71	OPXYLE	ppb	5	5	5	***	440	EPAP		Xylene-o,p
A80	CHLFORM	ppb	5	5	2		100	EPA		Chloroform [Trichloromethane]
A93	METHYCH	ppb	10	5	3		.			Methylene chloride
B14	M-XYLE	ppb	5	5	5	***	440	EPAP		Xylene-m
C76	PHOSPHA	ppb	1000	5	5	***	.			Phosphate
H18	FZINC	ppb	5	5	2		5000	EPAS		Zinc, filtered
H19	FCALCIU	ppb	50	5	0		.			Calcium, filtered
H25	FNICKEL	ppb	10	5	5	***	.			Nickel, filtered
H26	FCOPPER	ppb	10	5	5	***	1300	EPAP		Copper, filtered
H27	FVANADI	ppb	5	5	2		.			Vanadium, filtered
H28	FALUMIN	ppb	150	5	5	***	.			Aluminum, filtered
H30	FPOTASS	ppb	100	5	0		.			Potassium, filtered
H32	FMAGNES	ppb	50	5	0		.			Magnesium, filtered
H68	HEXONE	ppb	10	5	5	***	.			Hexone

TABLE I. (contd)

*** - Indicates all samples were reported as below contractual detection limits
xxx - Indicates that Drinking Water Standards were exceeded
EPA - based on Maximum Contaminant Levels given in 40 CFR Part 141 (July,1987) National Primary Drinking Water Regulations as amended by 52 FR 25690
EPAR - based on National Interim Primary Drinking Water Regulations, Appendix IV, EPA-570/9-76-003
EPAP - based on proposed Maximum Contaminant Level Goals in 50 FR 46936
EPAS - based on Secondary Maximum Contaminant Levels given in 40 CFR Part 143 National Secondary Drinking Water Regulations
WDOE - based on additional Secondary Maximum Contaminant Levels given in WAC 248-54, Public Water Supplies

INTRODUCTION

The U.S. Department of Energy-Richland Operations Office (DOE-RL) owns, and Westinghouse Hanford Company operates, facilities at the Hanford Site in southeastern Washington (Figure 1). Hanford is one of many DOE installations across the United States involved in a variety of activities related to energy research and development, nuclear weapons, and national security. A number of Hanford facilities use and generate hazardous materials and wastes, which must be managed so that public health and the environment are protected. The Resource Conservation and Recovery Act (RCRA), which became law in 1976, provides a regulatory structure for the management of solid waste, which includes hazardous wastes. The Pacific Northwest Laboratory (PNL) initiated RCRA site characterization and ground-water monitoring activities in 1985 for UNC Nuclear Industries, Westinghouse Hanford Company, and Rockwell Hanford Operations, all Hanford operating contractors at the time. Pacific Northwest Laboratory designed the program to meet the requirements contained in RCRA, at 40 CFR 265, and in WAC 173-303.

This report describes the progress accomplished during July 1 through September 30, 1988 on ground-water monitoring projects for the 12 Hanford Site waste disposal facilities: 300 Area Process Trenches, 183-H Solar Evaporation Basins, 200 Areas Low-Level Burial Grounds, Nonradioactive Dangerous Waste Landfill, 1301-N Liquid Waste Disposal Facility, 1324-N/NA Surface Impoundment and Percolation Ponds, 1325-N Liquid Waste Disposal Facility, 216-A-10 Crib, 216-A-29 Ditch, 216-A-36B Crib, 216-B-3 Pond, and the 2101-M Pond. Information on the 216-A-10 Crib and the 216-B-3 Pond is being provided for the first time.

Eight previous quarterly reports (PNL 1986; 1987a,b,c,d; 1988b,c,d) have been issued in this series and cover the period from May 1, 1986, to June 30, 1988. This report includes activities conducted during the third calendar quarter of 1988 (July 1 to September 30, 1988). Analytical results from sampling activities accomplished during the last month of this quarter were not available in time for inclusion in this report and will be reported in the next quarterly report (October 1 to December 31, 1988).

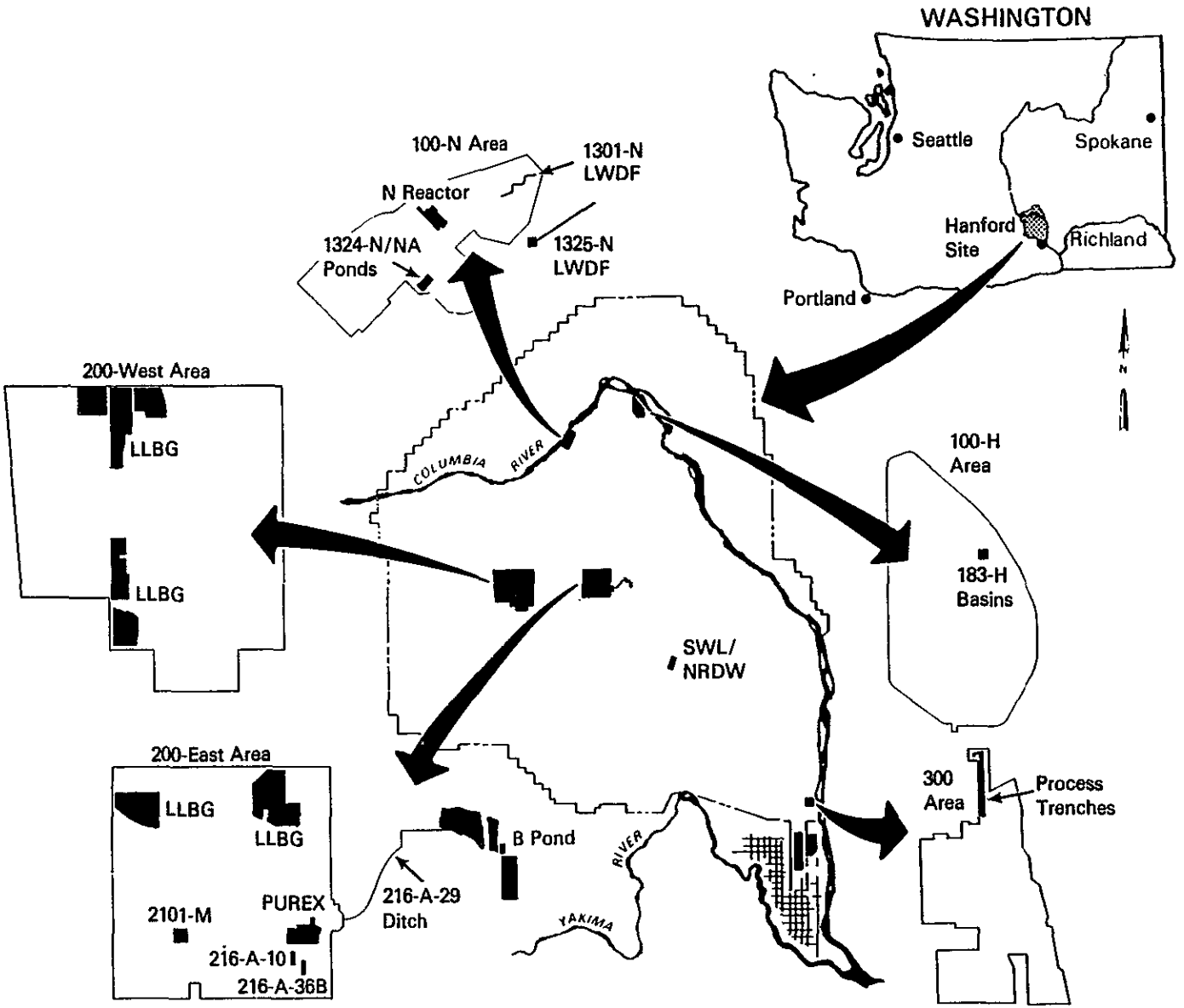

FIGURE 1. Resource Conservation and Recovery Act Ground-Water Monitoring Projects on the Hanford Site, Washington

300 AREA PROCESS TRENCHES

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Previously issued reports (PNL 1986; 1987a,b,c,d; 1988b,c,d) contain information on the progress made and the data obtained by the Resource Conservation and Recovery Act (RCRA) Interim-Status Ground-Water Monitoring Project for the 300 Area Process Trenches during the period from May 1, 1986, through June 30, 1988. This section includes information on subsequent activities through September 30, 1988.

DRILLING AND HYDROGEOLOGIC CHARACTERIZATION

No drilling activities occurred during this quarter. As reported last quarter, construction of five new intermediate-depth monitoring wells, which were scheduled to be installed in April 1988, has been postponed because the funding is needed for drilling at other higher-priority RCRA sites. Other types of hydrogeologic data collection and analysis activities are discussed below.

Hydrogeologic Characterization

Hydrogeologic characterization efforts were limited to the continuation of work performed by Washington State University staff and efforts by Pacific Northwest Laboratory (PNL) on refinement of the hydrogeologic conceptual model and time-series analysis of surface-water and ground-water data to aid in this year's ground-water modeling effort. The well locations, ground-water flow pattern, and layout of the 300 Area and vicinity is shown in Figure 2.

Final revisions were completed on the Interim Characterization Report of the 300 Area Process Trenches, and the report was submitted for final approval and publishing. The report contains information on the results of monitoring and characterization studies around the 300 Area Process Trenches. The interim report is primarily a compendium of currently available technical information on the 300 Area; ground-water monitoring data interpretations are limited to the most obvious conclusions. Final conclusions, particularly regarding rate and extent of migration of contaminants and ground-water

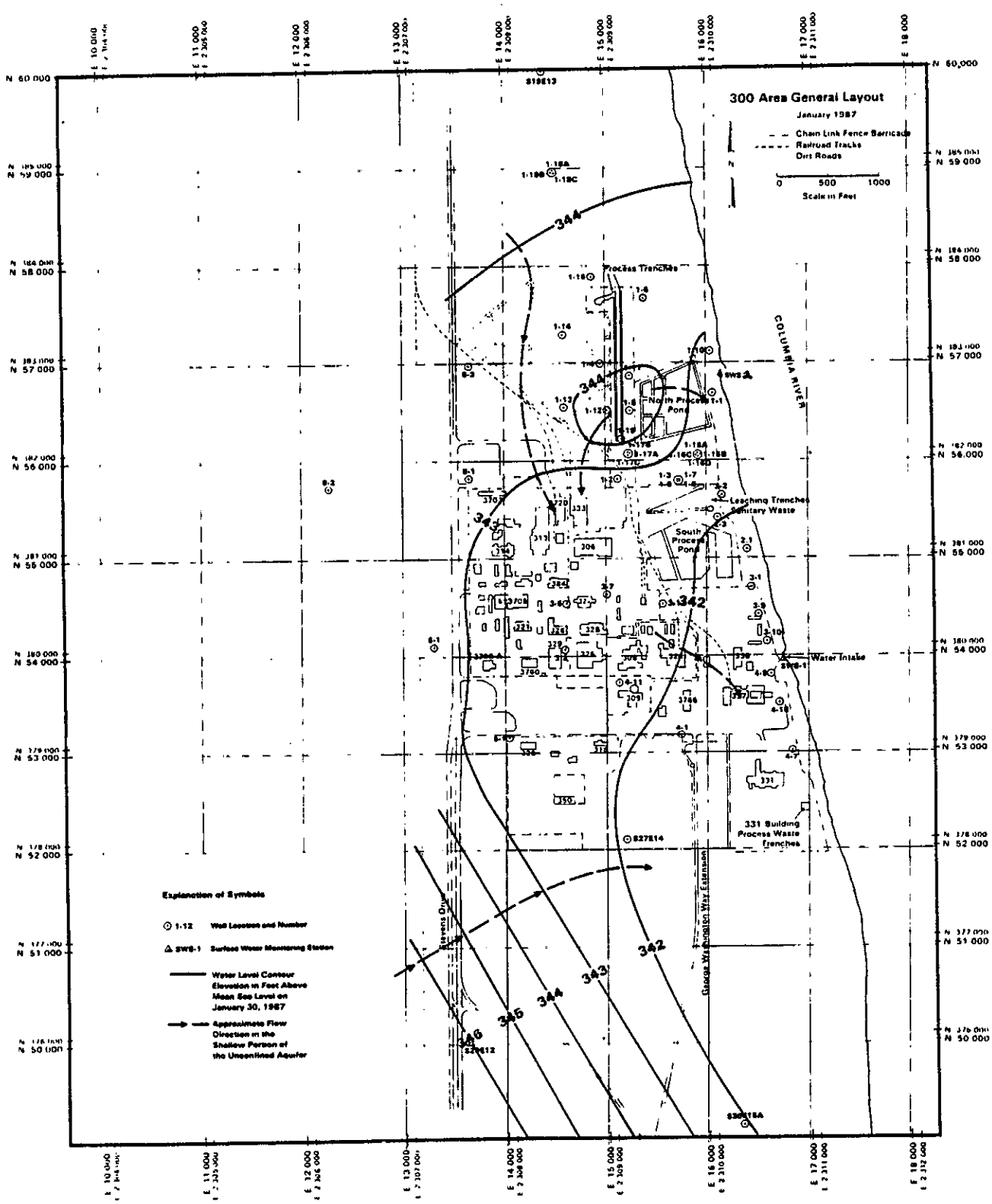

FIGURE 2. Monitoring Well Locations and Ground-Water Flow Pattern Near the 300 Area Process Trenches (January 30, 1987)

flow velocities, will be presented in the final characterization report following completion of site characterization.

Work was completed on the annual report of geologic and geohydrologic site characterization studies during 1988 by David R. Gaylord of Washington State University and Eileen Poeter of Colorado School of Mines (Gaylord and Poeter 1988). A major portion of their report addresses hydrologic and geologic analyses and assessments pertaining exclusively to the 300 Area. Specific topics covered in the report include stratigraphic correlation and compositional analysis, estimates of hydraulic conductivity and specific yield from sediment data, interpretations of hydrofacies, results of an electrical resistivity survey, hydraulic diffusivity estimates from time series analysis, evaluation of the nitrate plumes, assessment of aquifer tests, and pre-analysis of a proposed ground-water tracer test.

Nonroutine field data collection was discontinued last quarter; however, existing geologic and hydrostratigraphic data were evaluated for the 300 Area and areas extending beyond the immediate study area. Routine data collection has continued and includes collection of continuous surface-water and ground-water levels using data loggers, and monthly measurement of water levels in the network of 49 wells in the 300 Area.

Frequent water-level monitoring is continuing at one (SWS-1) of the two surface-water monitoring stations on the Columbia River, shown in Figure 2 as SWS-1 and SWS-2, and in monitoring wells 399-1-10, 399-1-13, 399-1-15, 399-1-16A, and 399-1-18A. The second, temporary surface-water station was inoperative this quarter because of equipment failure. Currently, all seven data loggers record measurements every half hour. These data are essential for setting the spatial and temporal boundary conditions for models of the 300 Area. The goal of this effort is to provide the project with a quantitative description for the stage of the Columbia River as a function of time at the 300 Area. Daily discharge data have been analyzed by using computer codes for filtering, performing spectral analyses, and computing time-series statistics on the river stage data. Previous progress was made toward delineating the bounds of predictability in river stage, as well as quantitatively defining the relationship of river stage to ground-water level;

however, these activities were suspended during this quarter, but are scheduled to resume in November 1988.

Work on the model for evaluating southerly ground-water flow was suspended this quarter. Redefining and expanding model boundaries cannot proceed until analyses of surface-water and ground-water data to determine the appropriate time steps and boundary conditions are completed. At the time work was suspended, configuration of the network was being evaluated to determine the need for revisions to make it a more comprehensive predictive tool for dealing with multiple sources of contamination.

GROUND-WATER SAMPLING AND ANALYSIS

In addition to the quarterly sampling of 34 wells in August, the ground water near the 300 Area Process Trenches has been sampled for the first half of this quarter on a weekly basis from three adjacent wells. The results are discussed later in this section.

Collection and Analysis

The quarterly sampling network consists of the same 34 monitoring wells used previously. Three wells (399-1-11, 399-1-17A, and 399-1-19) near the process trenches have been sampled weekly for a limited set of specific constituents (i.e., volatile chlorinated hydrocarbons, anions, and uranium). Analyses of field samples by an independent laboratory have been conducted to confirm the results from United States Testing Company (UST), the contracted analytical laboratory.

Discussion of Results

Analytical data obtained from weekly samples taken in June and July 1988 from wells 399-1-11, 399-1-17A, and 399-1-19 are discussed in the following paragraphs. The results were generally consistent with those obtained previously for these wells. The samples continued to show the presence of uranium, anions (i.e., chloride, fluoride, nitrate, sulfate, and phosphate), and low concentrations of volatile organics in the ground water near the process trenches.

The samples from the network of 34 monitoring wells were analyzed in August for a list of organic and inorganic constituents that is considered standard for the 300 Area monitoring network. The tables in this section show both the weekly and monthly results. Uranium and volatile organic chemicals continued to be detected in wells throughout the network. Quarterly samples were analyzed for gross alpha (uranium) in August. Inorganic and organic constituents were collected and analyzed under the RCRA program.

Gross alpha activities, which consist primarily of uranium (as indicated by uranium and gross alpha analyses) peaked in May then declined by August in all wells adjacent to and immediately downgradient from the process trenches (Figure 3). Except for a slight increase in well 399-4-7, wells upgradient (i.e., north and west several hundred feet) and a considerable distance south and downgradient from the trenches showed a decline in uranium concentrations or remained unchanged (Figure 4). Uranium concentrations for samples collected in June and July are shown in Table 1.

All results obtained for samples collected during August 1988 are summarized in Table 2. The samples from the network of 34 monitoring wells were analyzed in August for a standard list of constituents for the 300 Area monitoring program. Table 3 lists the constituents analyzed during this quarter.

Volatile organic chemicals detected in samples collected in August include chloroform, methylene chloride, perchloroethene (PCE), 1,1,1-trichloroethane (TCA), tetrachloromethane, trans-1,2-dichloroethene (DCE), and trichloroethene (TCE). The only volatile organic chemicals present in concentrations greater than the drinking water standards were TCE (drinking water standard is 5 ppb) in well 399-1-16B with a concentration of 19 ppb, and carbon tetrachloride (drinking water standard is 5 ppb) in upgradient well 399-1-18A with a concentration of 6 ppb. The concentration of TCE in well 399-1-16A is similar to that measured in November 1987 and May 1988. Tetrachloromethane was also detected in upgradient well 399-8-2, and its concentration was equal to the drinking water standard. Chloroform

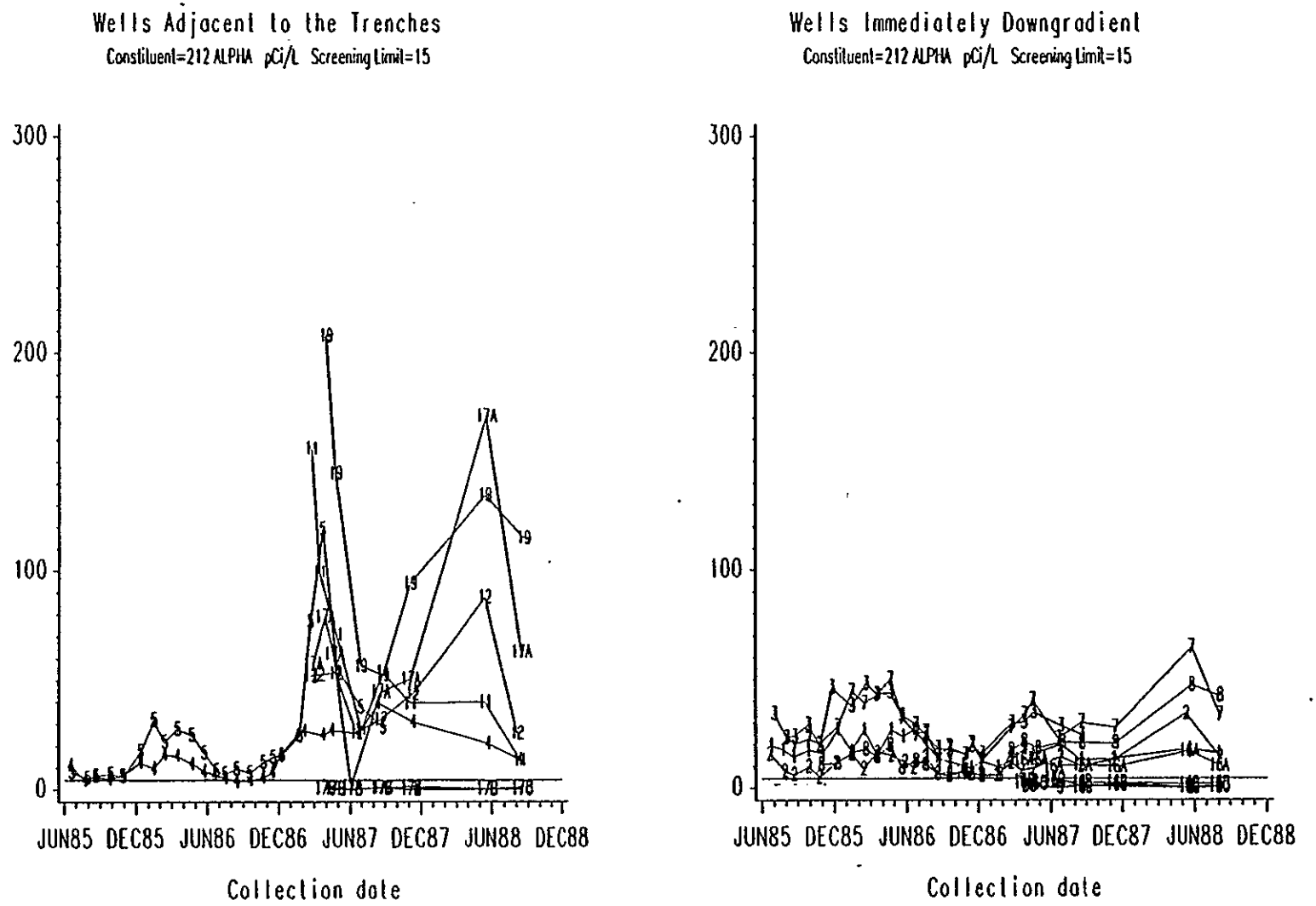

FIGURE 3. Gross Alpha Activities in Wells Adjacent to and Immediately Downgradient from the 300 Area Process Trenches. (Plotting symbols are abbreviations of well names. Horizontal solid line is contractual detection level.)

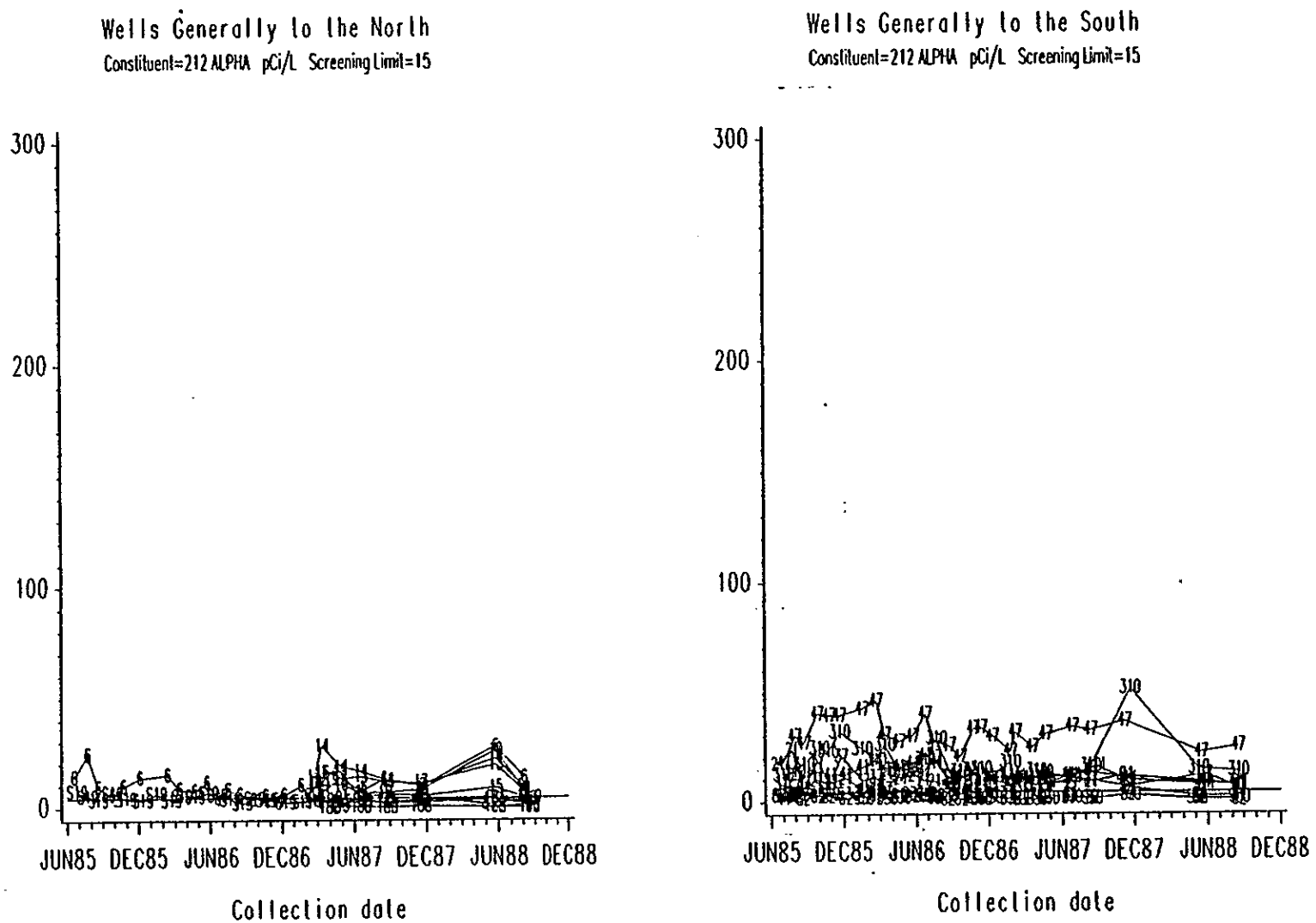

FIGURE 4. Gross Alpha Activities in Wells Generally to the North and Generally to the South of the 300 Area Process Trenches. (Plotting symbols are abbreviations of well names. Horizontal solid line is contractual detection level.)

TABLE 1. Constituents with at Least One Detected Value for the 300 Area Process Trenches, June, July, and August 1988

Weekly Sampling

Well name	Collection Date	Duplicate sample number	1,1,1-T ppb 5/200	CHLFORM ppb 5/100	CHLORID ppb 500/250000s	CONDFLD umho 1/700w	FLUORID ppb 500/4000	METHYCH ppb 10/.	NITRATE ppb 500/45000
3-1-11	02JUN88		<5	21	36,300	226	<500	<10	1,520
	08JUN88		<5	23	4,810	126	<500	<10	1,270
	16JUN88		<5	27	5,800	142	<500	<10	2,110
	23JUN88		<5	28	74,800	329	<500	<10	1,630
	29JUN88		<5	28	8,970	158	<500	#9	<500
	07JUL88		<5	37	5,880	140	<500	<10	1,460
3-1-17A	02JUN88		<5	18	6,560	159	<500	<10	2,340
	08JUN88		<5	18	10,500	162	<500	<10	2,180
	16JUN88		<5	20	19,500	198	<500	<10	1,940
	23JUN88		<5	24	19,500	165	<500	<10	1,870
	29JUN88		<5	25	20,700	207	<500	<10	2,250
	07JUL88		<5	31	28,200	230	<500	<10	1,380
3-1-19	02JUN88		<5	17	7,430	169	<500	#7	2,110
	08JUN88		<5	17	20,500	193	<500	<10	2,100
	16JUN88		<5	17	26,800	210	<500	<10	3,100
	23JUN88		<5	19	16,600	185	<500	<10	1,920
	29JUN88		<5	21	28,100	238	<500	<10	1,660
	07JUL88		<5	27	27,100	225	<500	<10	1,490

Well name	Collection Date	Duplicate sample number	PERCENE ppb 5/.	PHFIELD 0.1/8.5s	SULFATE ppb 500/250000s	TETRANE ppb 5/5	TRANDCE ppb 10/70p	TRICENE ppb 5/5	U-CHEM ug/L 0.725/.
3-1-11	02JUN88		<5	7.3	18,700	<5	.	<5	36.3
	08JUN88		<5	7.3	17,500	<5	.	<5	24.0
	16JUN88		<5	7.1	17,000	<5	.	<5	24.3
	23JUN88		<5	6.8	15,600	<5	.	<5	30.5
	29JUN88		<5	7.0	17,000	<5	.	<5	20.1
	07JUL88		<5	7.3	16,200	<5	.	<5	18.1
3-1-17A	02JUN88		<5	7.1	20,000	<5	.	<5	151.0
	08JUN88		<5	7.9	18,500	<5	.	<5	152.0
	16JUN88		<5	7.1	18,600	<5	.	<5	136.0
	23JUN88		<5	7.4	17,700	<5	.	<5	137.0
	29JUN88		<5	7.0	17,100	<5	.	<5	149.0
	07JUL88		<5	7.2	16,600	<5	.	<5	123.0
3-1-19	02JUN88		<5	7.2	18,800	<5	.	#3	186.0
	08JUN88		<5	7.9	18,500	<5	#3	5	195.0
	16JUN88		<5	7.2	18,000	<5	#3	#4	186.0
	23JUN88		<5	7.5	16,600	<5	.	#3	164.0
	29JUN88		<5	7.0	16,700	<5	#3	#3	197.0
	07JUL88		#3	7.1	16,900	<5	#4	#4	148.0

TABLE 2. Summary of Sampling Results for the 300 Area Process Trenches, August 1988

Well name	Collection Date	Duplicate sample number	1,1,1-T ppb 5/200	ALPHA pCi/L 4/15	ARSENIC ppb 5/50	FARSENI ppb 5/50	BARIUM ppb 6/1000	FBARIUM ppb 6/1000	BETA pCi/L 8/50	FCADMIU ppb 2/10
3-1-1	02AUG88		<5	15.700	<5	<5	37	34	9.49	<2
3-1-2	04AUG88		<5	14.100	<5	<5	20	21	6.68	<2
3-1-4	11AUG88		<5	13.600	<5	<5	21	22	5.70	2
3-1-6	04AUG88		<5	13.300	<5	<5	19	23	14.40	<2
3-1-7	03AUG88		<5	33.700	<5	<5	25	27	31.30	<2
3-1-8	04AUG88		<5	42.400	<5	<5	31	32	30.50	<2
3-1-9	03AUG88		<5	*0.161	<5	<5	116	112	5.46	<2
3-1-10	01AUG88		<5	8.150	<5	<5	26	25	10.50	<2
3-1-11	11AUG88		<5	13.300	<5	<5	26	23	10.50	<2
3-1-12	04AUG88		<5	25.600	<5	<5	15	19	10.70	<2
3-1-13	01AUG88		<5	8.130	<5	<5	16	19	6.80	<2
	01AUG88	1	<5	6.960	.	<5	.	21	6.92	3
3-1-14	01AUG88		<5	9.270	<5	<5	16	15	7.72	<2
3-1-15	01AUG88		<5	4.490	<5	<5	21	22	8.97	<2
3-1-16A	02AUG88		<5	9.940	<5	<5	31	30	9.31	2
	02AUG88	1	<5	10.200	.	<5	.	30	10.20	<2
3-1-16B	02AUG88		<5	1.830	<5	<5	52	56	7.17	<2
3-1-16C	02AUG88		<5	*0.432	<5	<5	57	62	8.10	<2
3-1-17A	15AUG88		<5	63.100	<5	<5	25	24	39.00	<2
3-1-17B	15AUG88		<5	*0.926	<5	<5	87	80	7.99	<2
3-1-17C	15AUG88		<5	*-0.903	<5	<5	88	86	13.00	<2
3-1-18A	16AUG88		<5	1.390	5	5	56	52	22.40	<2
3-1-18B	16AUG88		<5	*-0.376	<5	<5	38	50	7.74	<2
3-1-18C	16AUG88		<5	*1.140	<5	<5	78	79	10.20	<2
3-1-19	22AUG88		<5	115.000	<5	<5	25	22	67.60	<2
3-2-1	17AUG88		<5	7.840	<5	<5	47	51	11.80	<2
3-3-7	19AUG88		<5	5.740	<5	<5	44	16	11.20	<2
3-3-10	17AUG88		<5	13.600	<5	<5	42	38	8.68	<2
3-4-1	19AUG88		<5	6.460	<5	<5	35	36	13.70	<2
3-4-7	17AUG88		<5	25.100	<5	<5	46	42	16.10	<2
3-4-11	17AUG88		<5	7.880	<5	<5	35	38	6.97	<2
3-8-1	18AUG88		<5	1.990	5	5	38	42	9.70	<2
3-8-2	18AUG88		<5	*0.314	6	6	45	46	9.28	<2
3-8-3	18AUG88		<5	3.480	5	5	38	42	10.20	<2
6-S30-E15A	19AUG88		<5	1.090	<5	<5	58	52	8.79	<2
6-S19-E13	22AUG88		35	3.930	5	6	47	48	17.00	<2

TABLE 2. (contd)

Well name	Collection Date	Duplicate sample number	CADMIUM ppb 2/10	FCALCIU ppb 50/.	CALCIUM ppb 50/.	CHLFORM ppb 5/100	CHLORID ppb 500/250000s	CHROMUM ppb 10/50	COLIFRM MPN 2.2/1	CONDFLD umho 1/700w
3-1-1	02AUG88		3	22,000	23,800	22	20,700	<10	<2.2	230
3-1-2	04AUG88		<2	23,200	21,600	23	8,550	<10	<2.2	176
3-1-4	11AUG88		<2	18,700	20,400	27	6,030	<10	<2.2	209
3-1-6	04AUG88		<2	22,400	20,900	24	6,520	<10	<2.2	149
3-1-7	03AUG88		<2	25,800	26,700	24	27,100	<10	<2.2	154
3-1-8	04AUG88		<2	21,900	20,700	14	20,000	<10	<2.2	219
3-1-9	03AUG88		<2	17,300	17,400	<5	10,200	11	<2.2	228
3-1-10	01AUG88		<2	20,600	21,800	24	13,700	<10	<2.2	155
3-1-11	11AUG88		<2	20,400	24,800	28	20,800	<10	<2.2	245
3-1-12	04AUG88		<2	16,900	17,500	26	8,580	<10	<2.2	185
3-1-13	01AUG88		<2	20,700	22,200	21	8,270	<10	<2.2	159
	01AUG88	1	.	20,100	.	19	8,110	.	.	.
3-1-14	01AUG88		<2	20,600	22,100	20	8,470	<10	<2.2	162
3-1-15	01AUG88		<2	21,200	22,300	21	8,630	<10	<2.2	167
3-1-16A	02AUG88		<2	21,500	26,000	24	27,300	<10	<2.2	265
	02AUG88	1	.	23,000	.	24	26,100	.	.	.
3-1-16B	02AUG88		<2	19,700	19,600	<5	10,800	<10	<2.2	276
3-1-16C	02AUG88		<2	13,100	12,800	<5	10,300	<10	<2.2	421
3-1-17A	15AUG88		<2	18,800	19,600	22	11,500	<10	<2.2	190
3-1-17B	15AUG88		<2	21,400	20,300	<5	8,980	<10	<2.2	300
3-1-17C	15AUG88		<2	10,600	12,400	<5	9,600	<10	<2.2	310
3-1-18A	16AUG88		<2	46,600	57,200	<5	17,400	<10	<2.2	427
3-1-18B	16AUG88		<2	14,400	11,600	<5	9,900	<10	<2.2	351
3-1-18C	16AUG88		<2	13,600	15,300	<5	9,960	<10	<2.2	366
3-1-19	22AUG88		<2	19,600	22,000	21	19,000	<10	<2.2	205
3-2-1	17AUG88		<2	24,200	24,500	17	14,200	<10	2.2	195
3-3-7	19AUG88		<2	24,800	46,300	41	15,500	<10	<2.2	366
3-3-10	17AUG88		<2	26,700	30,200	12	7,850	<10	<2.2	229
3-4-1	19AUG88		<2	39,500	40,000	<5	10,500	<10	<2.2	324
3-4-7	17AUG88		<2	40,000	43,500	#3	12,600	<10	<2.2	332
3-4-11	17AUG88		<2	42,500	39,700	6	8,730	<10	<2.2	338
3-8-1	18AUG88		<2	46,000	43,900	<5	8,220	<10	<2.2	337
3-8-2	18AUG88		<2	45,100	46,200	<5	9,800	<10	<2.2	337
3-8-3	18AUG88		<2	43,000	42,900	<5	10,600	<10	<2.2	348
6-S30-E15A	19AUG88		<2	64,900	65,900	#4	5,280	<10	<2.2	429
6-S19-E13	22AUG88		<2	42,600	43,200	<5	17,100	<10	<2.2	420

TABLE 2. (contd)

Well name	Collection Date	Duplicate sample number	COPPER ppb 10/1300p	FCOPPER ppb 10/1300p	FLUORID ppb 500/4000	IRON ppb 30/300s	FIRON ppb 30/300s	FLEAD ppb 5/50	MAGNES ppb 50/.	FMAGNES ppb 50/.
3-1-1	02AUG88		18	<10	<500	<30	<30	<5.0	4,460	4,370
3-1-2	04AUG88		10	<10	<500	40	<30	<5.0	4,540	4,770
3-1-4	11AUG88		<10	13	<500	<30	<30	<5.0	4,150	3,950
3-1-6	04AUG88		14	15	<500	34	33	<5.0	4,410	4,600
3-1-7	03AUG88		<10	<10	<500	71	<30	<5.0	5,300	5,010
3-1-8	04AUG88		<10	<10	<500	55	41	<5.0	6,180	6,450
3-1-9	03AUG88		<10	<10	1070	263	100	<5.0	7,240	7,090
3-1-10	01AUG88		<10	11	<500	<30	<30	<5.0	4,480	4,420
3-1-11	11AUG88		17	15	<500	<30	<30	<5.0	5,340	4,600
3-1-12	04AUG88		<10	11	<500	<30	<30	<5.0	3,620	3,420
3-1-13	01AUG88		<10	<10	<500	36	<30	<5.0	4,720	4,660
	01AUG88	1	.	17	<500	.	<30	<5.0	.	4,530
3-1-14	01AUG88		<10	<10	<500	<30	<30	19.5	4,260	4,170
3-1-15	01AUG88		11	11	<500	38	<30	<5.0	5,310	5,280
3-1-16A	02AUG88		<10	15	<500	<30	<30	<5.0	4,750	4,280
	02AUG88	1	.	14	<500	.	<30	<5.0	.	4,400
3-1-16B	02AUG88		<10	<10	1190	99	75	<5.0	6,410	6,900
3-1-16C	02AUG88		<10	<10	1570	279	54	<5.0	4,840	5,270
3-1-17A	15AUG88		16	16	<500	32	<30	<5.0	3,970	3,860
3-1-17B	15AUG88		<10	<10	915	152	152	<5.0	6,630	7,550
3-1-17C	15AUG88		<10	<10	1700	82	87	<5.0	4,860	4,620
3-1-18A	16AUG88		<10	<10	<500	<30	<30	<5.0	14,200	12,600
3-1-18B	16AUG88		<10	<10	1460	199	204	<5.0	4,850	5,980
3-1-18C	16AUG88		<10	<10	1540	113	103	<5.0	5,690	5,620
3-1-19	22AUG88		14	13	<500	910	40	<5.0	4,520	4,390
3-2-1	17AUG88		<10	<10	<500	43	68	<5.0	5,070	5,080
3-3-7	19AUG88		<10	<10	<500	43	<30	<5.0	9,480	5,260
3-3-10	17AUG88		<10	<10	<500	179	163	<5.0	6,190	5,620
3-4-1	19AUG88		<10	<10	<500	54	<30	<5.0	7,720	8,170
3-4-7	17AUG88		<10	<10	<500	<30	<30	<5.0	8,180	7,680
3-4-11	17AUG88		<10	<10	<500	<30	<30	<5.0	7,930	8,730
3-8-1	18AUG88		<10	<10	<500	<30	<30	<5.0	9,130	9,930
3-8-2	18AUG88		<10	<10	<500	31	<30	<5.0	9,560	9,620
3-8-3	18AUG88		<10	<10	<500	<30	<30	<5.0	9,030	9,350
6-S30-E15A	19AUG88		<10	<10	<500	57	84	<5.0	11,800	11,000
6-S19-E13	22AUG88		<10	<10	<500	37	<30	<5.0	11,900	13,000

TABLE 2. (contd)

Well name	Collection Date	Duplicate sample number	FMANGAN ppb 5/60s	MANGESE ppb 5/60s	METHYCH ppb 10/.	NICKEL ppb 10/.	FNICKEL ppb 10/.	NITRATE ppb 500/46000	PERCENE ppb 5/.	PHFIELD 0.1/8.5s
3-1-1	02AUG88		<5	<5	<10	<10	<10	1,920	<5	7.2
3-1-2	04AUG88		<5	<5	<10	<10	<10	1,810	<5	7.5
3-1-4	11AUG88		<5	<5	<10	<10	<10	1,300	<5	7.2
3-1-6	04AUG88		<5	<5	<10	<10	<10	1,690	<5	7.1
3-1-7	03AUG88		<5	<5	<10	<10	<10	1,670	#3	6.8
3-1-8	04AUG88		16	14	<10	<10	<10	871	<5	7.5
3-1-9	03AUG88		68	70	<10	<10	<10	<500	<5	7.5
3-1-10	01AUG88		<5	6	<10	<10	<10	1,690	<5	6.8
3-1-11	11AUG88		<5	<5	<10	<10	<10	1,470	<5	6.9
3-1-12	04AUG88		<5	<5	<10	<10	13	1,870	<5	7.1
3-1-13	01AUG88		<5	<5	<10	<10	<10	717	<5	7.5
	01AUG88	1	<5	.	<10	.	<10	675	<5	.
3-1-14	01AUG88		<5	<5	<10	<10	<10	572	<5	7.2
3-1-15	01AUG88		<5	<5	<10	<10	<10	987	<5	7.6
3-1-16A	02AUG88		<5	<5	<10	34	36	1,830	<5	7.4
	02AUG88	1	<5	.	<10	.	36	1,850	<5	.
3-1-16B	02AUG88		93	92	<10	<10	<10	<500	<5	7.7
3-1-16C	02AUG88		61	59	<10	<10	<10	<500	<5	8.0
3-1-17A	15AUG88		<5	<5	<10	<10	<10	1,350	#4	6.7
3-1-17B	15AUG88		73	68	<10	<10	<10	<500	<5	7.5
3-1-17C	15AUG88		23	27	<10	<10	<10	<500	<5	7.7
3-1-18A	16AUG88		<5	<5	<10	<10	<10	19,400	<5	8.1
3-1-18B	16AUG88		49	41	<10	<10	<10	<500	<5	8.3
3-1-18C	16AUG88		49	54	<10	<10	<10	<500	<5	8.4
3-1-19	22AUG88		<5	34	<10	<10	<10	1,910	#4	6.8
3-2-1	17AUG88		<5	<5	<10	<10	<10	8,780	<5	7.1
3-3-7	19AUG88		<5	<5	<10	<10	<10	14,600	<5	7.5
3-3-10	17AUG88		22	13	<10	<10	<10	11,000	<5	6.7
3-4-1	19AUG88		<5	<5	<10	<10	<10	13,200	<5	7.8
3-4-7	17AUG88		<5	8	<10	<10	<10	14,100	<5	6.3
3-4-11	17AUG88		<5	<5	<10	<10	<10	14,200	<5	7.8
3-8-1	18AUG88		<5	<5	<10	<10	<10	20,500	<5	7.8
3-8-2	18AUG88		<5	<5	<10	<10	<10	23,200	#4	7.7
3-8-3	18AUG88		<5	<5	<10	<10	<10	12,600	<5	7.9
6-S30-E15A	19AUG88		9	<5	<10	<10	<10	16,900	<5	7.4
6-S19-E13	22AUG88		<5	<5	<10	<10	<10	22,700	15	7.7

TABLE 2. (contd)

Well name	Collection Date	Duplicate sample number	FPOTASS ppb 100/.	POTASUM ppb 100/.	RADIUM pCi/L 1/5	SODIUM ppb 200/.	FSODIUM ppb 200/.	SULFATE ppb 500/250000s	TETRANE ppb 5/5	TOC ppb 1000/.
3-1-1	02AUG88		2,330	2,290	*-0.00722	10,100	10,700	17,000	<5	<712
3-1-2	04AUG88		2,930	2,800	*0.04360	9,300	10,000	19,400	<5	<729
3-1-4	11AUG88		2,190	2,250	*0.02040	7,750	7,690	16,100	<5	<871
3-1-6	04AUG88		2,410	2,190	*0.08870	6,800	7,350	17,200	<5	1,130
3-1-7	03AUG88		2,620	2,650	*-0.00344	15,100	15,200	17,700	<5	<778
3-1-8	04AUG88		4,690	4,460	*-0.04040	21,900	22,700	13,500	<5	<561
3-1-9	03AUG88		5,560	5,650	*0.06100	53,500	50,800	784	<5	<310
3-1-10	01AUG88		2,380	2,380	*0.08770	9,070	9,150	17,300	<5	<742
3-1-11	11AUG88		1,840	2,050	*0.07290	14,700	13,600	16,300	<5	1,030
3-1-12	04AUG88		1,970	1,950	0.30600	12,800	12,700	17,500	<5	<792
3-1-13	01AUG88		3,230	3,180	*-0.00800	9,640	10,100	17,500	<5	<872
	01AUG88	1	3,180	.	.	.	9,530	17,400	<5	.
3-1-14	01AUG88		2,590	2,590	*-0.09550	7,420	7,500	17,100	<5	<866
3-1-15	01AUG88		4,260	4,230	*0.04560	9,360	9,440	17,300	<5	<840
3-1-16A	02AUG88		2,340	2,450	*0.11400	11,800	11,600	17,300	<5	<641
	02AUG88	1	2,420	.	.	.	11,700	17,400	<5	.
3-1-16B	02AUG88		5,840	5,210	*0.02450	50,800	57,800	7,030	<5	<389
3-1-16C	02AUG88		6,760	5,960	*0.05120	55,100	63,300	721	<5	<308
3-1-17A	15AUG88		2,100	2,170	*0.12200	14,500	14,000	17,000	<5	1,120
3-1-17B	15AUG88		7,120	5,960	*0.11300	46,700	56,100	1,200	<5	<396
3-1-17C	15AUG88		10,600	10,600	*0.05390	67,200	68,600	<500	<5	<340
3-1-18A	16AUG88		6,620	7,130	0.16100	26,100	24,900	46,900	6	<444
3-1-18B	16AUG88		7,630	6,380	*0.03440	59,600	75,400	<500	<5	<280
3-1-18C	16AUG88		7,390	7,160	*0.14400	69,600	71,300	1,210	<5	<314
3-1-19	22AUG88		2,060	1,940	*0.08660	12,700	13,500	17,100	<5	<950
3-2-1	17AUG88		3,570	3,560	*0.11900	13,800	14,200	16,900	<5	<846
3-3-7	19AUG88		2,290	5,190	*0.04840	20,400	5,710	39,700	<5	<645
3-3-10	17AUG88		3,070	3,640	*-0.10500	11,700	10,600	20,800	<5	<721
3-4-1	19AUG88		4,850	4,480	*0.08080	14,800	16,500	28,000	<5	<556
3-4-7	17AUG88		4,120	4,600	0.18100	18,300	17,100	34,500	<5	<493
3-4-11	17AUG88		4,810	4,610	*0.02500	15,300	16,600	28,600	<5	<482
3-8-1	18AUG88		5,500	5,250	*-0.00207	13,800	15,000	29,600	<5	<487
3-8-2	18AUG88		5,340	5,930	*-0.00437	20,000	18,900	30,000	#4	<957
3-8-3	18AUG88		5,490	5,640	*-0.01050	20,700	21,500	47,100	<5	<391
6-S30-E15A	19AUG88		5,870	6,040	*0.01210	12,100	12,200	19,200	<5	<821
6-S19-E13	22AUG88		6,710	5,670	*0.11900	19,400	23,300	55,600	<5	<385

TABLE 2. (contd)

Well name	Collection Date	Duplicate sample number	TOXLDL ppb 20/.	TRANDCE ppb 10/70p	TRICENE ppb 5/5	U-CHEM ug/L 0.725/.	FVANADI ppb 5/.	VANADUM ppb 5/.	ZINC ppb 5/5000s	FZINC ppb 5/5000s
3-1-1	02AUG88		28.30	.	<5	.	<5	<5	13	<5
3-1-2	04AUG88		#19.40	.	<5	.	<5	<5	9	<5
3-1-4	11AUG88		40.00	.	<5	.	9	8	8	9
3-1-6	04AUG88		24.50	.	<5	.	6	<5	20	24
3-1-7	03AUG88		34.20	#2	#3	.	6	<5	6	<5
3-1-8	04AUG88		#10.70	.	<5	.	<5	<5	6	<5
3-1-9	03AUG88		#7.00	.	<5	.	<5	<5	6	<5
3-1-10	01AUG88		36.00	.	<5	.	<5	<5	<5	<5
3-1-11	11AUG88		63.20	.	<5	20.6	7	<5	6	<5
3-1-12	04AUG88		46.70	.	<5	.	9	<5	<5	6
3-1-13	01AUG88		29.00	.	<5	.	<5	<5	<5	<5
	01AUG88	1	.	.	<5	.	7	.	.	<5
3-1-14	01AUG88		37.70	.	<5	.	<5	<5	<5	<5
3-1-15	01AUG88		29.70	.	<5	.	6	7	<5	<5
3-1-16A	02AUG88		24.40	.	<5	.	<5	<5	9	9
	02AUG88	1	.	.	<5	.	<5	.	.	9
3-1-16B	02AUG88		52.20	59	19	.	<5	<5	7	<5
3-1-16C	02AUG88		#0.30	.	<5	.	<5	<5	5	<5
3-1-17A	15AUG88		41.30	.	<5	92.8	9	7	17	<5
3-1-17B	15AUG88		#15.50	12	<5	.	<5	<5	<5	7
3-1-17C	15AUG88		#0.85	.	<5	.	<5	<5	<5	<5
3-1-18A	16AUG88		#6.90	.	<5	.	10	15	<5	<5
3-1-18B	16AUG88		#3.40	.	<5	.	<5	<5	7	<5
3-1-18C	16AUG88		#0.35	.	<5	.	<5	<5	9	13
3-1-19	22AUG88		49.10	.	<5	128.0	<5	<5	12	<5
3-2-1	17AUG88		31.90	.	<5	.	6	<5	15	8
3-3-7	19AUG88		25.00	.	<5	.	<5	12	<5	<5
3-3-10	17AUG88		38.30	.	<5	.	<5	<5	9	8
3-4-1	19AUG88		#5.60	.	<5	.	6	9	<5	<5
3-4-7	17AUG88		#8.90	.	<5	.	6	7	<5	9
3-4-11	17AUG88		#11.20	.	#4	.	7	8	<5	<5
3-8-1	18AUG88		#1.80	.	#3	.	9	8	<5	<5
3-8-2	18AUG88		#2.60	.	<5	.	12	9	5	<5
3-8-3	18AUG88		#0.55	.	#3	.	12	8	<5	7
6-S30-E15A	19AUG88		#-2.50	.	<5	.	<5	8	51	110
6-S19-E13	22AUG88		#0.10	.	<5	.	16	15	16	<5

TABLE 2. (contd)

The column headers consist of : Constituent Name
Analysis Units
Contractual Detection Limit/Drinking Water Standard(suffix)

Suffix
none - based on Maximum Contaminant Levels given in 40 CFR Part 141 (July,1987) National Primary Drinking Water Regulations as amended by 52 FR 25690
r - based on National Interim Primary Drinking Water Regulations, Appendix IV, EPA-570/9-76-003
p - based on proposed Maximum Contaminant Level Goals in 50 FR 46936
s - based on Secondary Maximum Contaminant Levels given in 40 CFR Part 143 (July, 1987) National Secondary Drinking Water Regulations
w - based on additional Secondary Maximum Contaminant Levels given in WAC 248-54, Public Water Supplies

Data flags
< - Less than Contractual Detection Limit, reported as Limit
- Less than Contractual Detection Limit, measured value reported
* - For radioactive constituents, reported value is less than 2-sigma error

TABLE 3. Constituents Analyzed for the 300 Area Process Trenches, June, July, and August 1988

Constituent List=Contamination Indicators

Constituent Code	Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standard	Water Standards Agency	Exceeded	Full name
191	CONDFLD	umho	1	52	0		700	WDOE		Specific conductance, field
199	PHFIELD		0.1	52	0		6.5-8.5	EPAS		pH, field
C69	TOC	ppb	1000	34	0		.			Total organic carbon
H42	TOXLDL	ppb	20	34	0		.			Total organic halogens, low DL

Constituent List=Drinking Water Standards

Constituent Code	Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standard	Water Standards Agency	Exceeded	Full name
109	COLIFRM	MPN	2.2	34	33		1	EPA		Coliform bacteria
111	BETA	pCi/L	8	36	0		50	EPA	xxx	Gross beta
181	RADIUM	pCi/L	1	34	0		5	EPA		Total radium
212	ALPHA	pCi/L	4	36	0		15	EPA	xxx	Gross alpha
A06	BARIUM	ppb	6	34	0		1000	EPA		Barium
A07	CADMIUM	ppb	2	34	33		10	EPA		Cadmium
A08	CHROMUM	ppb	10	34	33		50	EPA		Chromium
A10	SILVER	ppb	10	34	34	***	50	EPA		Silver
A20	ARSENIC	ppb	5	34	29		50	EPA		Arsenic
A21	MERCURY	ppb	0.1	34	34	***	2	EPA		Mercury
A22	SELENUM	ppb	5	34	34	***	10	EPA		Selenium
A33	ENDRIN	ppb	0.1	34	34	***	0.2	EPA		Endrin
A34	METHLOR	ppb	3	34	34	***	100	EPA		Methoxychlor
A35	TOXAENE	ppb	1	34	34	***	5	EPA		Toxaphene
A36	a-BHC	ppb	0.1	34	34	***	4	EPA		Alpha-BHC
A37	b-BHC	ppb	0.1	34	34	***	4	EPA		Beta-BHC
A38	g-BHC	ppb	0.1	34	34	***	4	EPA		Gamma-BHC
A39	d-BHC	ppb	0.1	34	34	***	4	EPA		Delta-BHC
A51	LEADGF	ppb	5	34	34	***	50	EPA		Lead (graphite furnace)
A61	TETRANE	ppb	5	54	52		5	EPA	xxx	Tetrachloromethane [Carbon Tetrachloride
A67	1,1,1-T	ppb	5	54	53		200	EPA		1,1,1-Trichloroethane
A69	TRICENE	ppb	5	54	43		5	EPA	xxx	Trichloroethylene [1,1,2-Trichloroethene
A80	CHLFORM	ppb	5	54	13		100	EPA		Chloroform [Trichloromethane]
C72	NITRATE	ppb	500	54	8		45000	EPA		Nitrate
C74	FLUORID	ppb	500	54	47		4000	EPA		Fluoride
H13	2,4-D	ppb	2	34	34	***	100	EPA		2,4-D [2,4-Dichlorophenoxyacetic acid]
H14	2,4,5TP	ppb	2	34	34	***	10	EPA		2,4,5-TP silvex
H20	FBARIUM	ppb	6	36	0		1000	EPA		Barium, filtered
H21	FCADMIU	ppb	2	36	33		10	EPA		Cadmium, filtered
H22	FCHROMI	ppb	10	36	36	***	50	EPA		Chromium, filtered
H23	FSILVER	ppb	10	36	36	***	50	EPA		Silver, filtered
H37	FARSENI	ppb	5	36	31		50	EPA		Arsenic, filtered
H38	FMERCUR	ppb	0.1	34	34	***	2	EPA		Mercury, filtered
H39	FSELENI	ppb	5	36	36	***	10	EPA		Selenium, filtered
H41	FLEAD	ppb	5	36	35		50	EPA		Lead, filtered

TABLE 3. (contd)

Constituent List=Quality Characteristics

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standard	Standards Agency	Exceeded	Full name
A11	SODIUM	ppb	200	34	0		.			Sodium
A17	MANGESE	ppb	5	34	22		50	EPAS	xxx	Manganese
A19	IRON	ppb	30	34	12		300	EPAS	xxx	Iron
C73	SULFATE	ppb	500	54	2		250000	EPAS		Sulfate
C75	CHLORID	ppb	500	54	0		250000	EPAS		Chloride
H24	FSODIUM	ppb	200	36	0		.			Sodium, filtered
H29	FMANGAN	ppb	5	36	26		50	EPAS	xxx	Manganese, filtered
H31	FIRON	ppb	30	36	23		300	EPAS		Iron, filtered
H57	LPHENOL	ppb	10	34	34	***	.			Phenol, low DL

Constituent List=Site Specific

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standard	Standards Agency	Exceeded	Full name
124	U-CHEM	ug/L	0.725	21	0		.			Uranium, chemical
A04	ZINC	ppb	5	34	14		5000	EPAS		Zinc
A05	CALCIUM	ppb	50	34	0		.			Calcium
A12	NICKEL	ppb	10	34	33		.			Nickel
A13	COPPER	ppb	10	34	27		1300	EPAP		Copper
A14	VANADUM	ppb	5	34	21		.			Vanadium
A16	ALUMNUM	ppb	150	34	34	***	.			Aluminum
A18	POTASUM	ppb	100	34	0		.			Potassium
A50	MAGNES	ppb	50	34	0		.			Magnesium
A64	METHONE	ppb	10	54	54	***	.			Methyl ethyl ketone
A68	1,1,2-T	ppb	5	54	54	***	.			1,1,2-Trichloroethane
A70	PERCENE	ppb	5	54	48		.			Perchloroethylene
A71	OPXYLE	ppb	5	54	54	***	440	EPAP		Xylene-o,p
A91	TRANDCE	ppb	10	7	0		70	EPAP		trans-1,2-Dichloroethene
A93	METHYCH	ppb	10	54	52		.			Methylene chloride
B14	M-XYLE	ppb	5	54	54	***	440	EPAP		Xylene-m
C76	PHOSPHA	ppb	1000	54	54	***	.			Phosphate
H18	FZINC	ppb	5	36	24		5000	EPAS		Zinc, filtered
H19	FCALCIU	ppb	50	36	0		.			Calcium, filtered
H25	FNICKEL	ppb	10	36	33		.			Nickel, filtered
H26	FCOPPER	ppb	10	36	25		1300	EPAP		Copper, filtered
H27	FVANADI	ppb	5	36	19		.			Vanadium, filtered
H28	FALUMIN	ppb	150	36	36	***	.			Aluminum, filtered
H30	FPOTASS	ppb	100	36	0		.			Potassium, filtered
H32	FMAGNES	ppb	50	36	0		.			Magnesium, filtered
H68	HEXONE	ppb	10	54	54	***	.			Hexone

*** - Indicates all samples were below detection limits
xxx - Indicates that Drinking Water Standards were exceeded
EPA - based on Maximum Contaminant Levels given in 40 CFR Part 141 (July,1987) National Primary Drinking Water Regulations as amended by 52 FR 25690
EPAR - based on National Interim Primary Drinking Water Regulations, Appendix IV, EPA-570/9-76-003
EPAP - based on proposed Maximum Contaminant Level Goals in 50 FR 46936
EPAS - based on Secondary Maximum Contaminant Levels given in 40 CFR Part 143 National Secondary Drinking Water Regulations
WDOE - based on additional Secondary Maximum Contaminant Levels given in WAC 248-54, Public Water Supplies

concentrations remained similar to or slightly more than those reported previous years for the summer quarter. Concentrations were at their annual summer high this quarter as shown in Figure 5. Methylene chloride was detected in wells 399-1-11 (9 ppb) and 399-1-19 (7 ppb) (7 ppb) in June. The intermediate-depth well 399-1-16B continued to show the presence of DCE (59 ppb), down slightly from an average concentration of 67 ppb during 1987. Well 399-8-2 continued to contain PCE, but no longer shows TCA. The concentration of PCE continued to decrease in August to 4 ppb from 5 ppb in May 1988, 6 ppb in March 1988, and 42 ppb in November 1987.

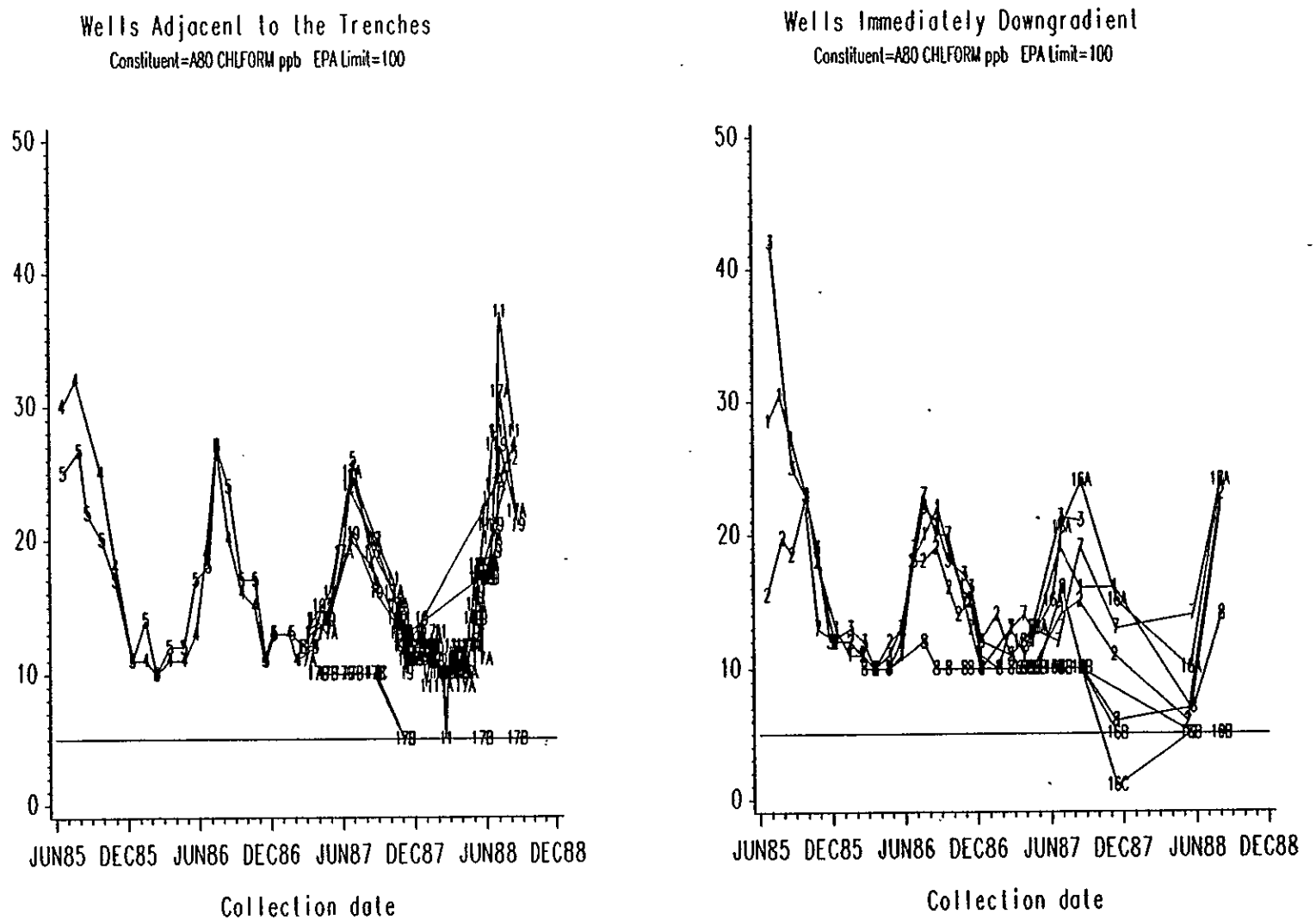

FIGURE 5. Chloroform Concentrations in Wells Immediately Adjacent to and Downgradient from the 300 Area Process Trenches. (Plotting symbols are abbreviations of well names. Horizontal solid line is contractual detection level.)

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183-H SOLAR EVAPORATION BASINS

S. H. Hall

Ground-water monitoring has been conducted at the 183-H Solar Evaporation Basins under RCRA interim status since 1985 (PNL 1986; PNL 1987a,b,c,d; PNL 1988b,c,d). An interim characterization report has been published (DOE 1987). The hydrogeologic characterization has now been completed, and a final characterization report is in press, with publication expected in October 1988. The facility operator, Westinghouse Hanford Company, has commenced closure activities, the most significant of which is the removal of chemical waste sludges from the basins.

Current project emphasis is twofold: 1) the contaminant plume in the ground water continues to be monitored, and 2) a program has been initiated to aid in the evaluation of engineering alternatives for final closure of the site. The latter includes both characterization of the residual contaminant load on the soil column around and beneath the basins, and the collection of ground-water and surface-water (Columbia River) level data to provide sufficient detail for mass transport computer modeling.

Progress of this project for the period July 1 to September 30, 1988, is described below.

DRILLING AND HYDROGEOLOGIC CHARACTERIZATION

No drilling was conducted during the reporting period. The principal efforts in hydrogeologic characterization, as described below, were 1) continued collection of water-level data from monitoring wells, and 2) the installation of one continuous river stage recorder.

Hydrogeologic Characterization

Water table elevations measured during the period are listed in Table 4. Well locations are shown in Figure 6.

In addition, a continuous river stage recorder was installed in the Columbia River north of the basins (see Figure 6) in August 1988. The recorder design described in the annual progress report (PNL 1988a) was

TABLE 4. Water-Level Measurements (in feet above MSL[(a)]) for 100-H Area Wells, July, August, and September 1988

Well Number	7/11/88	8/17/88	9/12/88	9/28/88
199-H3-1	375.73	375.54	375.46	
199-H3-2A	375.35	375.06	375.06	374.97
199-H3-2B	375.34	375.06	375.06	374.97
199-H4-3	373.77	373.18	373.69	373.41
199-H4-4	372.66	372.29	372.64	373.32
199-H4-5	373.29	372.67	373.35	373.09
199-H4-6	375.35	375.07	375.07	374.99
199-H4-7	374.51	374.04	374.27	374.06
199-H4-8	374.09	373.53	373.96	373.66
199-H4-9	373.73	373.04	373.67	373.32
199-H4-10	373.26	372.69	373.32	373.15
199-H4-11	372.18	371.90	372.08	372.43
199-H4-12A	372.96	372.52	372.97	372.97
199-H4-12B	372.99	372.51	372.98	372.96
199-H4-13	371.71	371.58	371.50	372.09
199-H4-14	375.07	374.70	374.74	374.63
199-H4-15A	373.17	372.64	373.19	373.08
199-H4-15B	373.17	372.66	373.21	373.10
199-H4-16	374.52	374.09	374.23	374.05
199-H4-17	373.89	373.37	373.83	373.57
199-H4-18	373.90	373.38	373.76	373.5

(a) MSL = mean sea level

modified to eliminate excavation associated with the stilling well, intake screen, and connecting pipe. As installed, the recorder appears as shown in Figure 7. The advantages of the modified design include lower cost and lessened environmental impact, both because of the elimination of excavation. The principal drawback of the design is the possibility of settling or shifting of the cement-weighted stilling well. Any such settling should be detectable by comparing water-level data from this new installation with

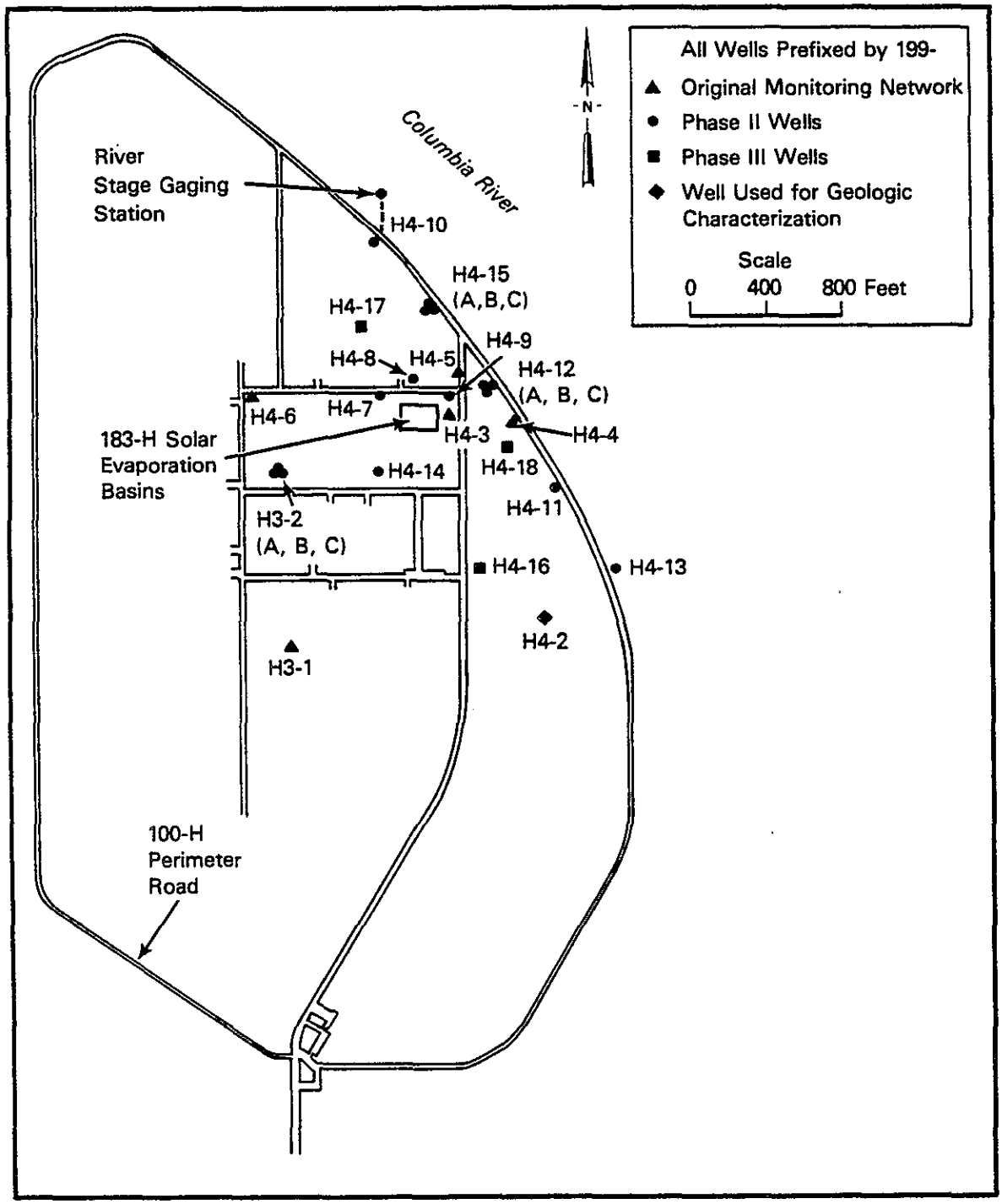
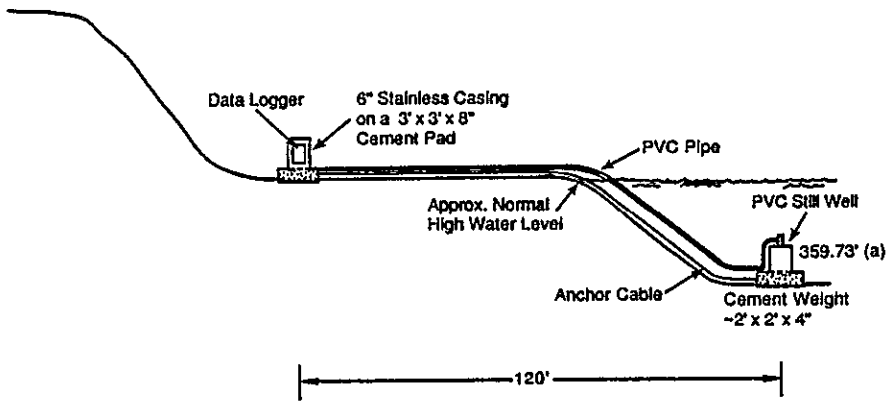


FIGURE 6. Monitoring Well Locations for the 183-H Solar Evaporation Basins



(a) Elevation of Sensing Element Above Mean Sea Level

FIGURE 7. Schematic Diagram of the River Stage Recorder Installed Adjacent to the 100-H Area

river-level data from the 100-N Area generating plant. Data from the river stage recorder are not yet available.

GROUND-WATER SAMPLING AND ANALYSIS

Ground water in the vicinity of the basins has been routinely sampled and analyzed since 1985. Monitoring activities for this quarter are discussed below.

Collection and Analysis

Eight wells were sampled in July, nine in August, and 23 in September. Analytical data for the September samples were not available by September 30 for inclusion in this report. Analytical data for samples collected in June (21 wells sampled) were not available for the previous quarterly report (PNL 1988d) and are included here.

Discussion of Results

Analytical results, beginning with the contamination indicator parameters, are summarized in Table 5. Eleven chemical parameters were found to exceed the appropriate drinking water standard in at least one well in the

TABLE 5. Summary of Sampling Results for the 183-H Solar Evaporation Basins, June, July, and August 1988

Constituent List=Contamination Indicators

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standard	Standards Agency	Exceeded	Full name
088	CONDLAB	umho	.	1	0		700	WDOE	xxx	Specific conductance, laboratory
191	CONDFLD	umho	1	44	0		700	WDOE	xxx	Specific conductance, field
199	PHFIELD		0.1	44	0		6.5-8.5	EPAS	xxx	pH, field
207	PH-LAB		0.01	38	0		6.5-8.5	EPAS		pH, laboratory
C68	TOX	ppb	100	39	0		.			Total organic halogen
C69	TOC	ppb	1000	39	0		.			Total organic carbon

Constituent List=Primary Drinking Water S

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standard	Standards Agency	Exceeded	Full name
109	COLIFRM	MPN	2.2	37	37	***	1	EPA		Coliform bacteria
111	BETA	pCi/L	8	43	0		50	EPA	xxx	Gross beta
121	SR-90	pCi/L	5	2	0		8	EPA		Strontium-90
181	RADIUM	pCi/L	1	39	0		5	EPA		Total radium
212	ALPHA	pCi/L	4	43	0		15	EPA	xxx	Gross alpha
A06	BARIUM	ppb	6	39	1		1000	EPA		Barium
A07	CADMIUM	ppb	2	39	39	***	10	EPA		Cadmium
A08	CHROMUM	ppb	10	39	1		50	EPA	xxx	Chromium
A10	SILVER	ppb	10	39	39	***	50	EPA		Silver
A20	ARSENIC	ppb	5	39	31		50	EPA		Arsenic
A21	MERCURY	ppb	0.1	39	39	***	2	EPA		Mercury
A22	SELENUM	ppb	5	39	38		10	EPA		Selenium
A33	ENDRIN	ppb	0.1	23	23	***	0.2	EPA		Endrin
A34	METHLOR	ppb	3	23	23	***	100	EPA		Methoxychlor
A35	TOXAENE	ppb	1	23	23	***	5	EPA		Toxaphene
A36	a-BHC	ppb	0.1	23	23	***	4	EPA		Alpha-BHC
A37	b-BHC	ppb	0.1	23	23	***	4	EPA		Beta-BHC
A38	g-BHC	ppb	0.1	23	23	***	4	EPA		Gamma-BHC
A39	d-BHC	ppb	0.1	23	23	***	4	EPA		Delta-BHC
A51	LEADGF	ppb	5	39	39	***	50	EPA		Lead (graphite furnace)
A61	TETRANE	ppb	5	43	43	***	5	EPA		Tetrachloromethane [Carbon Tetrachloride
A62	BENZENE	ppb	5	2	2	***	5	EPA		Benzene
A67	1,1,1-T	ppb	5	43	40		200	EPA		1,1,1-Trichloroethane
A69	TRICENE	ppb	5	43	43	***	5	EPA		Trichloroethylene [1,1,2-Trichloroethene
A90	1,2-DIC	ppb	10	2	2	***	5	EPA		1,2-Dichloroethane
A92	DICETHY	ppb	10	2	2	***	7	EPA		1,1-Dichloroethylene
B08	BROMORM	ppb	10	2	2	***	100	EPA		Bromoform [Tribromomethane]
B13	VINYIDE	ppb	10	2	2	***	2	EPA		Vinyl chloride
C72	NITRATE	ppb	500	44	0		45000	EPA	xxx	Nitrate
C74	FLUORID	ppb	500	44	40		4000	EPA		Fluoride
H13	2,4-D	ppb	2	23	23	***	100	EPA		2,4-D [2,4-Dichlorophenoxyacetic acid]
H14	2,4,5TP	ppb	2	23	23	***	10	EPA		2,4,5-TP silvex
H20	FBARIUM	ppb	6	43	3		1000	EPA		Barium, filtered
H21	FCADMIU	ppb	2	43	43	***	10	EPA		Cadmium, filtered
H22	FCHROMI	ppb	10	43	1		50	EPA	xxx	Chromium, filtered
H23	FSILVER	ppb	10	43	43	***	50	EPA		Silver, filtered
H37	FARSENI	ppb	5	43	37		50	EPA		Arsenic, filtered
H38	FMERCUR	ppb	0.1	39	39	***	2	EPA		Mercury, filtered
H39	FSELENI	ppb	5	43	43	***	10	EPA		Selenium, filtered
H41	FLEAD	ppb	5	43	43	***	50	EPA		Lead, filtered
H63	LFLUORD	ppb	20	43	0		4000	EPA		Fluoride, low DL

TABLE 5. (contd)

Constituent List=Quality Characteristics

Constituent Code	Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standards Standard	Agency	Exceeded	Full name
A11	SODIUM	ppb	200	39	0		.			Sodium
A17	MANGESE	ppb	5	39	32		50	EPAS	xxx	Manganese
A19	IRON	ppb	30	39	17		300	EPAS	xxx	Iron
C67	PHENOL	ppb	10	2	2	***	.			Phenol
C73	SULFATE	ppb	500	44	0		250000	EPAS		Sulfate
C75	CHLORID	ppb	500	44	0		250000	EPAS		Chloride
H24	FSODIUM	ppb	200	43	0		.			Sodium, filtered
H29	FMANGAN	ppb	5	43	40		50	EPAS	xxx	Manganese, filtered
H31	FIRON	ppb	30	43	41		300	EPAS		Iron, filtered
H57	LPHENOL	ppb	10	21	21	***	.			Phenol, low DL

Constituent List=Site Specific

Constituent Code	Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standards Standard	Agency	Exceeded	Full name
010	CO-60	pCi/L	22.5	2	0		100	EPAR		Cobalt-60
024	CS-137	pCi/L	20	2	0		200	EPAR		Cesium-137
034	RU-106	pCi/L	172.5	2	0		30	EPAR		Ruthenium-106
124	U-CHEM	ug/L	0.725	43	0		.			Uranium, chemical
197	TC-99	pCi/L	15	39	0		900	EPAR	xxx	Technetium-99
A01	BERYLUM	ppb	5	39	39	***	.			Beryllium
A03	STRONUM	ppb	20	39	0		.			Strontium
A04	ZINC	ppb	5	39	13		5000	EPAS		Zinc
A06	CALCIUM	ppb	50	39	0		.			Calcium
A12	NICKEL	ppb	10	39	31		.			Nickel
A13	COPPER	ppb	10	39	33		1300	EPAP		Copper
A14	VANADUM	ppb	5	39	14		.			Vanadium
A15	ANTIONY	ppb	100	39	39	***	.			Antimony
A16	ALUMNUM	ppb	150	39	37		.			Aluminum
A18	POTASUM	ppb	100	39	0		.			Potassium
A50	MAGNES	ppb	50	39	0		.			Magnesium
A64	METHONE	ppb	10	43	43	***	.			Methyl ethyl ketone
A68	1,1,2-T	ppb	5	43	43	***	.			1,1,2-Trichloroethane
A70	PERCENE	ppb	5	43	41		.			Perchloroethylene
A71	OPXYLE	ppb	5	43	43	***	440	EPAP		Xylene-o,p
A80	CHLFORM	ppb	5	43	4		100	EPA		Chloroform [Trichloromethane]
A93	METHYCH	ppb	10	43	36		.			Methylene chloride
B14	M-XYLE	ppb	5	43	43	***	440	EPAP		Xylene-m
C76	PHOSPHA	ppb	1000	44	44	***	.			Phosphate
C80	AMMONIU	ppb	50	43	42		.			Ammonium ion
H16	TC	ppb	1000	39	0		.			Total carbon
H17	TDS	ppb	5000	37	0		500000	EPAS	xxx	Total dissolved solids
H18	FZINC	ppb	5	43	25		5000	EPAS		Zinc, filtered
H19	FCALCIU	ppb	50	43	0		.			Calcium, filtered
H25	FNICKEL	ppb	10	43	37		.			Nickel, filtered
H26	FCOPPER	ppb	10	43	41		1300	EPAP		Copper, filtered
H27	FVANADI	ppb	5	43	17		.			Vanadium, filtered
H28	FALUMIN	ppb	150	43	43	***	.			Aluminum, filtered
H30	FPOTASS	ppb	100	43	0		.			Potassium, filtered
H32	FMAGNES	ppb	50	43	0		.			Magnesium, filtered
H33	FBERYLL	ppb	5	43	40		.			Beryllium, filtered
H35	FSTRONT	ppb	20	43	0		.			Strontium, filtered
H36	FANTIMO	ppb	100	43	43	***	.			Antimony, filtered
H58	ALKALIN	ppb	20000	36	0		.			Total alkalinity, as CaCO3
H68	HEXONE	ppb	10	43	43	***	.			Hexone

TABLE 5. (contd)

Constituent List=WAC 173-303-9905

Constituent Code	Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standard	Standards Agency Exceeded	Full name
A23	THALIUM	ppb	5	2	2	***	.		Thallium
A24	THIOURA	ppb	200	2	2	***	.		Thiourea
A25	ACETREA	ppb	200	2	2	***	.		1-Acetyl-2-thiourea
A26	CHLOREA	ppb	200	2	2	***	.		1-(o-Chlorophenyl) thiourea
A27	DIETROL	ppb	200	2	2	***	.		Diethylstilbesterol
A28	ETHYREA	ppb	200	2	2	***	.		Ethylenethiourea
A29	NAPHREA	ppb	200	2	2	***	.		1-Naphthyl-2-thiourea
A32	PHENREA	ppb	500	2	2	***	.		N-phenylthiourea
A40	DDD	ppb	0.1	2	2	***	.		DDD
A41	DDE	ppb	0.1	2	2	***	.		DDE
A42	DDT	ppb	0.1	2	2	***	.		DDT
A43	HEPTLOR	ppb	0.1	2	2	***	0	EPAP	Heptachlor
A44	HEPTIDE	ppb	0.1	2	2	***	0	EPAP	Heptachlor epoxide
A46	DIELRIN	ppb	0.1	2	2	***	.		Dieldrin
A47	ALDRIN	ppb	0.1	2	2	***	.		Aldrin
A48	CHLOANE	ppb	1	2	2	***	0	EPAP	Chlordane
A49	ENDO1	ppb	0.1	2	2	***	.		Endosulfan I (alpha)
A52	ENDO2	ppb	0.1	2	2	***	.		Endosulfan II (beta)
A63	DIOXANE	ppb	500	2	2	***	.		Dioxane
A65	PYRIDIN	ppb	500	2	2	***	.		Pyridine
A66	TOLUENE	ppb	5	2	2	***	2000	EPAP	Toluene
A72	ACROLIN	ppb	10	2	2	***	.		Acrolein
A73	ACRYILE	ppb	10	2	2	***	.		Acrylonitrile
A74	BISTHER	ppb	10	2	2	***	.		Bis(chloromethyl) ether
A75	BROMONE	ppb	10	2	2	***	.		Bromoacetone
A76	METHBRO	ppb	10	2	2	***	.		Methyl bromide
A77	CARBIDE	ppb	10	2	2	***	.		Carbon disulfide
A78	CHLBENZ	ppb	10	2	2	***	60	EPAP	Chlorobenzene
A79	CHLTHER	ppb	10	2	2	***	.		2-Chloroethyl vinyl ether
A81	METHCHL	ppb	10	2	2	***	.		Methyl chloride [Chloromethane]
A82	CHMTHER	ppb	10	2	2	***	.		Chloromethyl methyl ether
A83	CROTONA	ppb	10	2	2	***	.		Crotonaldehyde
A84	DIBRCHL	ppb	10	2	2	***	0	EPAP	1,2-Dibromo-3-chloropropane
A85	DIBRETH	ppb	10	2	2	***	.		1,2-Dibromoethane
A86	DIBRMET	ppb	10	2	2	***	.		Dibromomethane
A87	DIBUTEN	ppb	10	2	2	***	.		1,4-Dichloro-2-butene
A88	DICDIFM	ppb	10	2	2	***	.		Dichlorodifluoromethane
A89	1,1-DIC	ppb	10	2	2	***	.		1,1-Dichloroethane
A91	TRANDCE	ppb	10	2	2	***	70	EPAP	trans-1,2-Dichloroethene
A94	DICPANE	ppb	10	2	2	***	6	EPAP	1,2-Dichloropropane
A95	DICPENE	ppb	10	2	2	***	.		1,3-Dichloropropene
A96	NNDIEHY	ppb	10	2	2	***	.		N,N-diethylhydrazine
A99	HYDRSUL	ppb	10	2	2	***	.		Hydrogen sulfide
B01	IODOMET	ppb	10	2	2	***	.		Iodomethane
B02	METHACR	ppb	10	2	2	***	.		Methacrylonitrile
B03	METHTHI	ppb	10	2	2	***	.		Methanethiol
B04	PENTACH	ppb	10	2	2	***	.		Pentachloroethane
B05	1112-tc	ppb	10	2	2	***	.		1,1,1,2-Tetrachlorethane
B06	1122-tc	ppb	10	2	2	***	.		1,1,2,2-Tetrachlorethane
B09	TRCMEOL	ppb	10	2	2	***	.		Trichloromethanethiol
B10	TRCMFLM	ppb	10	2	2	***	.		Trichloromonofluoromethane
B11	TRCPANE	ppb	10	2	2	***	.		Trichloropropane

TABLE 5. (contd)

Constituent List=WAC 173-303-9905

Constituent Code	Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standards Standard	Agency Exceeded	Full name
B12	123-trp	ppb	10	2	2	***	.		1,2,3-Trichloropropane
B15	DIETHY	ppb	10	2	2	***	.		Diethylarsine
B19	ACETILE	ppb	3000	2	2	***	.		Acetonitrile
B20	ACETOPH	ppb	10	2	2	***	.		Acetophenone
B21	WARFRIN	ppb	10	2	2	***	.		Warfarin
B22	ACEFENE	ppb	10	2	2	***	.		2-Acetylaminofluorene
B23	AMINOYL	ppb	10	2	2	***	.		4-Aminobiphenyl
B24	AMIISOX	ppb	10	2	2	***	.		5-(Aminomethyl)-3-isoxazolol
B25	AMITROL	ppb	10	2	2	***	.		Amitrole
B26	ANILINE	ppb	10	2	2	***	.		Aniline
B27	ARAMITE	ppb	10	2	2	***	.		Aramite
B28	AURAMIN	ppb	10	2	2	***	.		Auramine
B29	BENZCAC	ppb	10	2	2	***	.		Benz[c]acridine
B30	BENZAAN	ppb	10	2	2	***	.		Benz[a]anthracene
B31	BENDICM	ppb	10	2	2	***	.		Benzene, dichloromethyl
B32	BENTHOL	ppb	10	2	2	***	.		Benzenethiol
B33	BENDINE	ppb	10	2	2	***	.		Benzidine
B34	BENZBFL	ppb	10	2	2	***	.		Benzo[b]fluoranthene
B35	BENZJFL	ppb	10	2	2	***	.		Benzo[j]fluoranthene
B36	PBENZQU	ppb	10	2	2	***	.		p-Benzoquinone
B37	BENZCHL	ppb	10	2	2	***	.		Benzyl chloride
B38	BIS2CHM	ppb	10	2	2	***	.		Bis(2-chloroethoxy) methane
B39	BIS2CHE	ppb	10	2	2	***	.		Bis(2-chloroethyl) ether
B40	BIS2EPH	ppb	10	2	2	***	.		Bis(2-ethylhexyl) phthalate
B41	BROPHEN	ppb	10	2	2	***	.		4-Bromophenyl phenyl ether
B42	BUTBENP	ppb	10	2	2	***	.		Butyl benzyl phthalate
B43	BUTDINP	ppb	10	2	2	***	.		2-sec-Butyl-4,6-dinitrophenol (DNBP)
B44	CHALETH	ppb	10	2	2	***	.		Chloroalkyl ethers
B45	CHLANIL	ppb	10	2	2	***	.		p-Chloroaniline
B46	CHLCRES	ppb	10	2	2	***	.		p-Chloro-m-cresol
B47	CHLEPOX	ppb	10	2	2	***	0	EPAP	1-Chloro-2,3-epoxypropane
B48	CHLNAPH	ppb	10	2	2	***	.		2-Chloronaphthalene
B49	CHLPHEN	ppb	10	2	2	***	.		2-Chlorophenol
B50	CHRYSEN	ppb	10	2	2	***	.		Chrysene
B51	CRESOLS	ppb	10	2	2	***	.		Cresols
B52	CYCHDIN	ppb	10	2	2	***	.		2-Cyclohexyl-4,6-dinitrophenol
B53	DIBAHAC	ppb	10	2	2	***	.		Dibenz[a,h]acridine
B54	DIBAJAC	ppb	10	2	2	***	.		Dibenz[a,j]acridine
B55	DIBAHAN	ppb	10	2	2	***	.		Dibenz[a,h]anthracene
B56	DIBCGCA	ppb	10	2	2	***	.		7H-Dibenzo[c,g]carbazole
B57	DIBAEPY	ppb	10	2	2	***	.		Dibenzo[a,e]pyrene
B58	DIBAHPY	ppb	10	2	2	***	.		Dibenzo[a,h]pyrene
B59	DIBAIPY	ppb	10	2	2	***	.		Dibenzo[a,i]pyrene
B60	DIBPHTH	ppb	10	2	2	***	.		Di-n-butyl phthalate
B61	12-dben	ppb	10	2	2	***	.		1,2-Dichlorobenzene
B62	13-dben	ppb	10	2	2	***	.		1,3-Dichlorobenzene
B63	14-dben	ppb	10	2	2	***	.		1,4-Dichlorobenzene
B64	DICHBEN	ppb	20	2	2	***	.		3,3'-Dichlorobenzidine
B65	24-dchp	ppb	10	2	2	***	.		2,4-Dichlorophenol
B66	26-dchp	ppb	10	2	2	***	.		2,6-Dichlorophenol
B67	DIEPHTH	ppb	10	2	2	***	.		Diethyl phthalate
B68	DIHYSAF	ppb	10	2	2	***	.		Dihydrosafrole

TABLE 5. (contd)

Constituent List=WAC 173-303-9905

Constituent Code	Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standards Standard Agency Exceeded	Full name
B69	DIMETHB	ppb	10	2	2	***	.	3,3'-Dimethoxybenzidine
B70	DIMEAMB	ppb	10	2	2	***	.	p-Dimethylaminoazobenzene
B71	DIMBENZ	ppb	10	2	2	***	.	7,12-Dimethylbenz[a]anthracene
B72	DIMEYLB	ppb	10	2	2	***	.	3,3'-Dimethylbenzidine
B73	THIONOX	ppb	10	2	2	***	.	Thiofanox
B74	DIMPHAM	ppb	10	2	2	***	.	alpha,alpha-Dimethylphenethylamine
B75	DIMPHEN	ppb	10	2	2	***	.	2,4-Dimethylphenol
B76	DIMPHTH	ppb	10	2	2	***	.	Dimethyl phthalate
B77	DINBENZ	ppb	10	2	2	***	.	Dinitrobenzene
B78	DINCRES	ppb	10	2	2	***	.	4,6-Dinitro-o-cresol and salts
B79	DINPHEN	ppb	50	2	2	***	.	2,4-Dinitrophenol
B80	24-dint	ppb	10	2	2	***	.	2,4-Dinitrotoluene
B81	26-dint	ppb	10	2	2	***	.	2,6-Dinitrotoluene
B82	DIOPHTH	ppb	10	2	2	***	.	Di-n-octyl phthalate
B83	DIPHAMI	ppb	10	2	2	***	.	Diphenylamine
B84	DIPHHYD	ppb	10	2	2	***	.	1,2-Diphenylhydrazine
B85	DIPRNIT	ppb	10	2	2	***	.	Di-n-propylnitrosamine
B86	ETHMINE	ppb	10	2	2	***	.	Ethyleneimine
B87	ETHMETS	ppb	10	2	2	***	.	Ethyl methanesulfonate
B88	FLUORAN	ppb	10	2	2	***	.	Fluoranthene
B89	HEXCBEN	ppb	10	2	2	***	.	Hexachlorobenzene
B90	HEXCBUT	ppb	10	2	2	***	.	Hexachlorobutadiene
B91	HEXCCYC	ppb	10	2	2	***	.	Hexachlorocyclopentadiene
B92	HEXCETH	ppb	10	2	2	***	.	Hexachloroethane
B93	INDENOP	ppb	10	2	2	***	.	Indeno(1,2,3-cd)pyrene
B94	ISOSOLE	ppb	10	2	2	***	.	Isosafrole
B95	MALOILE	ppb	10	2	2	***	.	Malononitrile
B96	MELPHAL	ppb	10	2	2	***	.	Melphalan
B97	METHAPY	ppb	10	2	2	***	.	Methapyrilene
B98	METHNYL	ppb	10	2	2	***	.	Metholonyl
B99	METAZIR	ppb	10	2	2	***	.	2-Methylaziridine
C01	METCHAN	ppb	10	2	2	***	.	3-Methylcholanthrene
C02	METBISC	ppb	10	2	2	***	.	4,4'-Methylenebis(2-chloroaniline)
C03	METACTO	ppb	10	2	2	***	.	2-Methyllactonitrile
C04	METACRY	ppb	10	2	2	***	.	Methyl methacrylate
C05	METMSUL	ppb	10	2	2	***	.	Methyl methanesulfonate
C06	METPROP	ppb	10	2	2	***	.	2-Methyl-2-(methylthio) propionaldehyde-O-(methylcarbamoyl)oxime
C07	METHIOU	ppb	10	2	2	***	.	Methylthiouracil
C08	NAPHQUI	ppb	10	2	2	***	.	1,4-Naphthoquinone
C09	1-napha	ppb	10	2	2	***	.	1-Naphthylamine
C10	2-napha	ppb	10	2	2	***	.	2-Naphthylamine
C11	NITRANI	ppb	50	2	2	***	.	p-Nitroaniline
C12	NITBENZ	ppb	10	2	2	***	.	Nitrobenzene
C13	NITPHEN	ppb	50	2	2	***	.	4-Nitrophenol
C14	NNIBUTY	ppb	10	2	2	***	.	N-nitrosodi-n-butylamine
C15	NNIDIEA	ppb	10	2	2	***	.	N-nitrosodiethanolamine
C16	NNIDIEY	ppb	10	2	2	***	.	N-nitrosodiethylamine
C17	NNIDIME	ppb	10	2	2	***	.	N-nitrosodimethylamine
C18	NNIMETH	ppb	10	2	2	***	.	N-nitrosomethylethylamine
C19	NNIURET	ppb	10	2	2	***	.	N-nitroso-n-methylurethane
C20	NNIVINY	ppb	10	2	2	***	.	N-nitrosomethylvinylamine
C21	NNIMORP	ppb	10	2	2	***	.	N-nitrosomorpholine

TABLE 5. (contd)

Constituent List=WAC 173-303-9905

Constituent Code	Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standards Standard	Agency Exceeded	Full name
C22	NNINICO	ppb	10	2	2	***	.		N-nitrosonornicotine
C23	NNIPIPE	ppb	10	2	2	***	.		N-nitrosopiperidine
C24	NITRPYR	ppb	10	2	2	***	.		Nitrosopyrrolidine
C25	NITRTOL	ppb	10	2	2	***	.		5-Nitro-o-toluidine
C26	PENTCHB	ppb	10	2	2	***	.		Pentachlorobenzene
C27	PENTCHN	ppb	10	2	2	***	.		Pentachloronitrobenzene
C28	PENTCHP	ppb	50	2	2	***	220	EPAP	Pentachlorophenol
C29	PHENTIN	ppb	10	2	2	***	.		Phenacetin
C30	PHENINE	ppb	10	2	2	***	.		Phenylenediamine
C31	PHTHEST	ppb	10	2	2	***	.		Phthalic acid esters
C32	PICOLIN	ppb	10	2	2	***	.		2-Picoline
C33	PRONIDE	ppb	10	2	2	***	.		Pronamide
C34	RESERPI	ppb	10	2	2	***	.		Reserpine
C35	RESORCI	ppb	10	2	2	***	.		Resorcinol
C36	SAFROL	ppb	10	2	2	***	.		Safrol
C37	TETRCHB	ppb	10	2	2	***	.		1,2,4,5-Tetrachlorobenzene
C39	TETRCHP	ppb	10	2	2	***	.		2,3,4,6-Tetrachlorophenol
C40	THIURAM	ppb	10	2	2	***	.		Thiuram
C41	TOLUDIA	ppb	10	2	2	***	.		Toluenediamine
C42	OTOLHYD	ppb	10	2	2	***	.		o-Toluidine hydrochloride
C43	TRICHLB	ppb	10	2	2	***	.		1,2,4-Trichlorobenzene
C44	245-trp	ppb	50	2	2	***	.		2,4,5-Trichlorophenol
C45	246-trp	ppb	10	2	2	***	.		2,4,6-Trichlorophenol
C46	TRIPHOS	ppb	10	2	2	***	.		O,o,o-triethyl phosphorothioate
C47	SYMTRIN	ppb	10	2	2	***	.		Sym-trinitrobenzene
C48	TRISPHO	ppb	10	2	2	***	.		Tris(2,3-dibromopropyl) phosphate
C49	BENZOPY	ppb	10	2	2	***	.		Benzo[a]pyrene
C50	CHLNAPZ	ppb	10	2	2	***	.		Chlornaphazine
C51	BIS2ETH	ppb	10	2	2	***	.		Bis(2-chloroisopropyl) ether
C52	HEXAENE	ppb	10	2	2	***	.		Hexachloropropene
C53	HYDRAZI	ppb	3000	2	2	***	.		Hydrazine
C54	HEXACHL	ppb	10	2	2	***	.		Hexachlorophene
C55	NAPHTHA	ppb	10	2	2	***	.		Naphthalene
C56	123TRI	ppb	10	2	2	***	.		1,2,3-Trichlorobenzene
C58	135TRI	ppb	10	2	2	***	.		1,3,5-Trichlorobenzene
C59	1234TE	ppb	10	2	2	***	.		1,2,3,4-Tetrachlorobenzene
C60	1235TE	ppb	10	2	2	***	.		1,2,3,5-Tetrachlorobenzene
C61	TETEPYR	ppb	2	2	2	***	.		Tetraethylpyrophosphate
C62	CHLLATE	ppb	30	2	2	***	.		Chlorobenzilate
C63	CARBPHT	ppb	2	2	2	***	.		Carbophenothion
C64	DISULFO	ppb	2	2	2	***	.		Disulfoton
C65	DIMETHO	ppb	2	2	2	***	.		Dimethoate
C66	METHPAR	ppb	2	2	2	***	.		Methyl parathion
C67	PARATHI	ppb	2	2	2	***	.		Parathion
C70	CYANIDE	ppb	10	2	2	***	.		Cyanide
C71	FORMALN	ppb	500	2	2	***	.		Formalin
C77	PERCHLO	ppb	1000	2	2	***	.		Perchlorate
C79	KEROSEN	ppb	10000	2	2	***	.		Kerosene
C87	CITRUSR	ppb	1000	2	2	***	.		Citrus red
C90	PARALDE	ppb	2000	2	2	***	.		Paraldehyde
C91	STRYCHN	ppb	50	2	2	***	.		Strychnine
C92	MALHYDR	ppb	500	2	2	***	.		Maleic hydrazide
C93	NICOTIN	ppb	100	2	2	***	.		Nicotinic acid

TABLE 5. (contd)

Constituent List=WAC 173-303-9905

Constituent Code	Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standard	Water Standards Agency Exceeded	Full name
C94	ACRYIDE	ppb	10000	2	2	***	0	EPAP	Acrylamide
C95	ALLYLAL	ppb	2500	2	2	***	.		Allyl alcohol
C97	CHLACET	ppb	16000	2	2	***	.		Chloroacetaldehyde
C98	CHLPROP	ppb	4000	2	2	***	.		3-Chloropropionitrile
H03	ETHCARB	ppb	5000	2	2	***	.		Ethyl carbamate
H04	ETHCYAN	ppb	2000	2	2	***	.		Ethyl cyanide
H05	ETHOXID	ppb	3000	2	2	***	.		Ethylene oxide
H06	ETHMETH	ppb	10	2	2	***	.		Ethyl methacrylate
H09	ISOBUTY	ppb	1000	2	2	***	.		Isobutyl alcohol
H11	PROPYLA	ppb	10000	2	2	***	.		n-Propylamine
H12	PROPYNO	ppb	8000	2	2	***	.		2-Propyn-1-ol
H15	2,4,5-T	ppb	2	2	2	***	.		2,4,5-T
H40	FTHALLI	ppb	5	2	2	***	.		Thallium, filtered
I21	TRIBUPH	ppb	10	2	2	***	.		Tributylphosphoric acid

*** - Indicates all samples were reported as below contractual detection limits
xxx - Indicates that Drinking Water Standards were exceeded
EPA - based on Maximum Contaminant Levels given in 40 CFR Part 141 (July,1987) National Primary Drinking Water Regulations as amended by 52 FR 25690
EPAR - based on National Interim Primary Drinking Water Regulations, Appendix IV, EPA-570/9-76-003
EPAP - based on proposed Maximum Contaminant Level Goals in 50 FR 46936
EPAS - based on Secondary Maximum Contaminant Levels given in 40 CFR Part 143 National Secondary Drinking Water Regulations
WDOE - based on additional Secondary Maximum Contaminant Levels given in WAC 248-54, Public Water Supplies

monitoring network surrounding the basins. These are specific conductance, gross beta, gross alpha, chromium (filtered and unfiltered sample), nitrate, manganese (filtered and unfiltered sample), iron (unfiltered), technetium-99, and total dissolved solids (directly related to specific conductance). One field pH value was reported that was outside the acceptable range of values (6.5 to 8.5), but that value is considered spurious. This list of contaminants exceeding water quality standards is essentially the same as that presented in the previous quarterly report (PNL 1988d).

Table 6 presents the analytical results by well for all constituents with at least one detected value for the period June through August 1988. Inspection of the data shows that technetium-99, gross beta, uranium, and gross alpha are correlated in the waste plume attributable to the basins.

Chromium concentrations in well 199-H4-14, which is upgradient from the basins, have continued to increase relative to the chromium concentrations found in well 199-H4-3, which is immediately downgradient from the basins.

Traces of chloroform were found in most wells. Methylene chloride was reported to be in samples from two upgradient wells, 199-H4-6 and 199-H4-14, and traces were reported in samples from three downgradient wells. Concentrations have not been consistent from month to month, and no significant pattern has emerged. Traces of 1,1,1-trichloroethane were detected in well 199-H4-3; this is consistent with previously reported results.

TABLE 6. Constituents with at Least One Detected Value for the 183-H Solar Evaporation Basins, June, July, and August 1988

Well name	Collection Date	Duplicate sample number	1,1,1-T ppb 5/200	ALKALIN ppb 20000/.	ALPHA pCi/L 4/15	ALUMNUM ppb 150/.	AMMONIU ppb 50/.	ARSENIC ppb 5/50	FARSENI ppb 5/50	BARIUM ppb 6/1000	FBARIUM ppb 6/1000
1-H3-1	17JUN88		<5	171,000	3.690	<150	<50	<5	<5	50	50
1-H3-2A	14JUN88		<5	110,000	*0.589	<150	<50	<5	<5	25	25
1-H3-2B	14JUN88		<5	123,000	3.170	<150	<50	<5	<5	33	32
1-H3-2C	14JUN88		<5	107,000	0.891	<150	<50	7	6	19	18
1-H4-3	07JUN88		27	.	105.000	<150	<50	5	<5	21	20
	10JUN88		.	.	.	.	.	.	.	.	.
	14JUL88		8	.	79.500	<150	<50	<5	<5	43	36
	10AUG88		<5	152,000	134.000	360	<50	<5	<5	46	17
1-H4-4	07JUN88		<5	116,000	26.300	<150	<50	<5	<5	43	41
	07JUN88	1	<5	.	25.300	.	<50	.	<5	.	44
	14JUL88		<5	.	68.500	<150	<50	5	5	48	49
	14JUL88	1	<5	.	67.600	.	<50	.	<5	.	46
	09AUG88		<5	135,000	82.000	<150	<50	5	<5	58	38
	09AUG88	1	<5	.	69.400	.	<50	.	<5	.	44
1-H4-5	13JUN88		<5	143,000	2.970	<150	<50	5	<5	69	77
1-H4-6	15JUN88		8	151,000	3.610	<150	<50	<5	<5	45	45
1-H4-7	13JUN88		<5	138,000	1.860	<150	<50	<5	<5	47	48
1-H4-8	13JUN88		<5	150,000	4.180	216	<50	<5	<5	48	50
1-H4-9	07JUN88		<5	162,000	4.910	<150	<50	8	9	59	61
	07JUN88	1	<5	.	4.590	.	<50	.	9	.	61
	13JUL88		<5	189,000	8.530	<150	<50	<5	<5	74	72
	10AUG88		<5	165,000	7.130	<150	<50	5	5	76	50
1-H4-10	08JUN88		<5	102,000	1.450	<150	<50	<5	<5	51	55
1-H4-11	09JUN88		<5	116,000	2.260	<150	<50	<5	<5	36	40
	13JUL88		<5	115,000	1.510	<150	<50	<5	<5	30	32
	09AUG88		<5	111,000	2.200	<150	137	<5	<5	43	14
1-H4-12A	06JUN88		<5	104,000	3.780	<150	<50	<5	<5	40	38
	12JUL88		<5	140,000	8.180	<150	<50	<5	<5	61	68
	08AUG88		<5	149,000	18.100	<150	<50	<5	<5	90	69
1-H4-12B	06JUN88		<5	132,000	4.360	<150	<50	<5	<5	91	95
	12JUL88		<5	145,000	3.880	<150	<50	<5	<5	106	101
	08AUG88		<5	152,000	5.980	<150	<50	<5	<5	131	103
1-H4-12C	06JUN88		<5	107,000	1.680	<150	<50	<5	5	8	8
	10JUN88		.	.	.	.	.	.	.	.	.
	12JUL88		<5	106,000	*0.587	<150	<50	<5	<5	<6	<6
	08AUG88		<5	108,000	*0.822	<150	<50	5	<5	9	<6
1-H4-13	09JUN88		<5	94,300	*0.941	<150	<50	<5	<5	26	28
1-H4-14	16JUN88		<5	99,200	1.320	<150	<50	<5	<5	21	20
	17JUN88		.	.	.	.	.	.	.	.	.
	14JUL88		<5	99,400	1.430	<150	<50	<5	<5	22	16
	10AUG88		<5	102,000	1.190	<150	<50	<5	<5	26	<6
1-H4-15A	08JUN88		<5	121,000	1.490	<150	<50	<5	<5	79	85
1-H4-15B	08JUN88		<5	128,000	1.250	<150	<50	<5	<5	124	139
1-H4-16	15JUN88		.	.	.	.	.	.	.	.	.
1-H4-17	16JUN88		.	.	.	.	.	.	.	.	.
1-H4-18	10JUN88		<5	116,000	1.960	<150	<50	<5	<5	33	37
	13JUL88		<5	114,000	1.500	<150	<50	<5	<5	29	28
	09AUG88		<5	115,000	*0.660	<150	<50	<5	<5	36	12

TABLE 6. (contd)

Well name	Collection Date	Duplicate sample number	FBERYLL ppb 5/.	BETA pCi/L 8/50	FCALCIU ppb 50/.	CALCIUM ppb 50/.	CHLFORM ppb 5/100	CHLORID ppb 500/250000s	FCHROMI ppb 10/50	CHROMUM ppb 10/50
1-H3-1	17JUN88		<5	11.10	80,600	77,800	8	12,000	52	60
1-H3-2A	14JUN88		<5	6.64	41,800	38,400	20	6,850	35	38
1-H3-2B	14JUN88		<5	8.59	50,900	48,000	15	7,500	48	46
1-H3-2C	14JUN88		<5	11.60	26,700	26,400	<5	2,790	<10	<10
1-H4-3	07JUN88		<5	175.00	15,400	14,900	12	10,800	176	186
	10JUN88		.	.	.	.	.	9,840	.	.
	14JUL88		<5	350.00	30,500	30,400	12	9,290	205	250
	10AUG88		<5	324.00	30,500	27,800	12	9,740	212	205
1-H4-4	07JUN88		<5	76.10	40,100	40,300	5	5,480	106	113
	07JUN88	1	<5	80.60	40,700	.	#4	5,500	106	.
	14JUL88		<5	158.00	34,800	31,800	11	6,940	200	180
	14JUL88	1	<5	187.00	35,200	.	11	6,930	185	.
	09AUG88		<5	241.00	40,100	37,600	12	7,140	214	233
	09AUG88	1	<5	257.00	46,200	.	13	7,270	245	.
1-H4-5	13JUN88		<5	7.23	82,300	73,300	11	9,100	142	127
1-H4-6	15JUN88		<5	8.28	73,100	59,200	#4	14,600	82	70
1-H4-7	13JUN88		<5	12.90	76,800	73,200	12	10,600	117	115
1-H4-8	13JUN88		<5	10.00	81,300	72,400	8	11,000	103	98
1-H4-9	07JUN88		<5	50.20	80,900	81,400	10	12,600	116	111
	07JUN88	1	<5	41.50	82,700	.	10	10,700	120	.
	13JUL88		5	92.90	102,000	106,000	12	9,920	91	109
	10AUG88		<5	91.40	98,700	93,100	8	10,400	110	119
1-H4-10	08JUN88		<5	*3.56	34,100	33,700	<5	3,910	47	46
1-H4-11	09JUN88		<5	76.40	57,300	51,100	22	5,370	158	145
	13JUL88		<5	78.40	53,000	52,400	26	5,050	142	148
	09AUG88		<5	72.10	58,200	59,300	23	5,060	114	136
1-H4-12A	06JUN88		<5	11.60	39,200	40,200	<5	3,770	54	56
	12JUL88		6	40.70	75,700	67,900	14	7,770	127	122
	08AUG88		<5	104.00	79,600	83,000	13	9,060	123	133
1-H4-12B	06JUN88		<5	15.20	58,900	64,500	8	7,020	118	120
	12JUL88		<5	25.80	74,300	72,900	14	7,780	117	131
	08AUG88		<5	57.50	77,100	82,000	13	9,100	109	132
1-H4-12C	06JUN88		<5	10.60	32,100	32,000	6	2,650	265	265
	10JUN88		.	.	.	.	.	.	.	.
	12JUL88		6	4.94	30,700	31,300	9	2,530	267	291
	08AUG88		<5	4.15	31,400	31,700	7	2,480	295	317
1-H4-13	09JUN88		<5	74.60	41,300	36,400	18	3,980	39	38
1-H4-14	16JUN88		<5	6.30	41,300	37,400	26	5,350	394	371
	17JUN88		.	.	.	.	.	.	.	.
	14JUL88		<5	*3.13	37,500	41,100	27	4,930	351	391
	10AUG88		<5	8.21	45,100	48,500	28	4,980	422	474
1-H4-15A	08JUN88		<5	6.56	51,800	50,700	<5	6,400	96	101
1-H4-15B	08JUN88		<5	4.73	56,600	54,200	7	6,250	122	125
1-H4-16	15JUN88		.	.	.	.	.	.	.	.
1-H4-17	16JUN88		.	.	.	.	.	.	.	.
1-H4-18	10JUN88		<5	15.60	51,100	46,800	22	5,830	210	192
	13JUL88		<5	16.00	48,700	51,500	26	5,170	230	254
	09AUG88		<5	8.71	52,200	51,200	26	4,870	271	283

TABLE 6. (contd)

Well name	Collection Date	Duplicate sample number	CO-60 pCi/L 22.6/100r	CONDFLD umho 1/700w	CONDLAB umho ./700w	COPPER ppb 10/1300p	FCOPPER ppb 10/1300p	CS-137 pCi/L 20/200r	FLUORID ppb 500/4000	LFLUORD ppb 20/4000
1-H3-1	17JUN88		*1.25	480	.	<10	<10	*0.994	<500	291
1-H3-2A	14JUN88		.	291	.	<10	<10	.	<500	220
1-H3-2B	14JUN88		.	340	.	<10	<10	.	<500	211
1-H3-2C	14JUN88		.	220	.	<10	<10	.	<500	366
1-H4-3	07JUN88		0.00	811	.	<10	<10	*3.730	756	281
	10JUN88		.	583	757	.	.	.	947	.
	14JUL88		.	1,112	.	18	17	.	<500	170
	10AUG88		.	1,089	.	16	<10	.	1020	204
1-H4-4	07JUN88		.	466	.	<10	<10	.	<500	238
	07JUN88	1	.	.	.	.	<10	.	<500	233
	14JUL88		.	629	.	18	<10	.	<500	282
	14JUL88	1	.	.	.	.	<10	.	<500	274
	09AUG88		.	1,050	.	11	<10	.	503	277
	09AUG88	1	.	.	.	.	<10	.	<500	286
1-H4-5	13JUN88		.	478	.	<10	<10	.	<500	174
1-H4-6	15JUN88		.	477	.	<10	<10	.	<500	225
1-H4-7	13JUN88		.	451	.	<10	<10	.	<500	187
1-H4-8	13JUN88		.	494	.	<10	<10	.	<500	189
1-H4-9	07JUN88		.	586	.	<10	<10	.	<500	255
	07JUN88	1	.	.	.	.	<10	.	<500	257
	13JUL88		.	736	.	<10	<10	.	<500	184
	10AUG88		.	717	.	<10	<10	.	<500	213
1-H4-10	08JUN88		.	288	.	12	<10	.	<500	251
1-H4-11	09JUN88		.	336	.	<10	<10	.	<500	165
	13JUL88		.	349	.	<10	<10	.	<500	146
	09AUG88		.	435	.	<10	<10	.	<500	151
1-H4-12A	06JUN88		.	283	.	<10	<10	.	<500	188
	12JUL88		.	489	.	<10	<10	.	<500	135
	08AUG88		.	695	.	<10	<10	.	<500	148
1-H4-12B	06JUN88		.	429	.	<10	<10	.	<500	148
	12JUL88		.	473	.	<10	<10	.	<500	127
	08AUG88		.	561	.	<10	<10	.	<500	132
1-H4-12C	06JUN88		.	245	.	<10	<10	.	<500	176
	10JUN88		.	177	.	.	.	.	.	.
	12JUL88		.	245	.	11	<10	.	<500	165
	08AUG88		.	260	.	<10	15	.	<500	183
1-H4-13	09JUN88		.	250	.	<10	<10	.	<500	192
1-H4-14	16JUN88		.	280	.	<10	<10	.	<500	191
	17JUN88		.	258	.	.	.	.	.	.
	14JUL88		.	250	.	<10	<10	.	<500	188
	10AUG88		.	296	.	<10	<10	.	<500	203
1-H4-15A	08JUN88		.	410	.	<10	<10	.	<500	181
1-H4-15B	08JUN88		.	430	.	<10	<10	.	<500	174
1-H4-16	15JUN88		.	234	.	.	.	.	.	.
1-H4-17	16JUN88		.	467	.	.	.	.	.	.
1-H4-18	10JUN88		.	232	.	<10	<10	.	<500	201
	13JUL88		.	343	.	<10	<10	.	<500	174
	09AUG88		.	419	.	<10	<10	.	<500	207

TABLE 6. (contd)

Well name	Collection Date	Duplicate sample number	IRON ppb 30/300s	FIRON ppb 30/300s	MAGNES ppb 50/.	FMAGNES ppb 50/.	FMANGAN ppb 5/50s	MANGESE ppb 5/50s	METHYCH ppb 10/.	NICKEL ppb 10/.	FNICKEL ppb 10/.
1-H3-1	17JUN88		404	<30	19,600	19,200	<5	14	<10	<10	<10
1-H3-2A	14JUN88		57	<30	9,170	9,490	<5	<5	<10	<10	<10
1-H3-2B	14JUN88		<30	<30	11,200	11,100	24	21	<10	<10	<10
1-H3-2C	14JUN88		<30	<30	8,830	8,380	<5	<5	<10	<10	<10
1-H4-3	07JUN88		152	<30	2,570	2,640	<5	<5	<10	10	13
	10JUN88		.	.	.	.	.	.	.	.	.
	14JUL88		1030	30	5,320	5,170	<5	13	<10	23	18
	10AUG88		719	<30	4,930	4,580	<5	18	<10	19	<10
1-H4-4	07JUN88		58	<30	7,270	7,130	<5	<5	<10	<10	<10
	07JUN88	1	.	<30	.	7,230	<5	.	<10	.	<10
	14JUL88		128	<30	5,220	5,630	<5	<5	<10	<10	10
	14JUL88	1	.	<30	.	5,760	<5	.	<10	.	<10
	09AUG88		232	<30	5,720	5,850	<5	<5	<10	11	<10
	09AUG88	1	.	<30	.	6,560	<5	.	<10	.	<10
1-H4-5	13JUN88		133	<30	12,700	14,200	<5	<5	<10	<10	<10
1-H4-6	15JUN88		146	<30	14,300	15,700	73	77	580	<10	<10
1-H4-7	13JUN88		46	<30	14,200	14,700	<5	<5	<10	<10	<10
1-H4-8	13JUN88		453	<30	12,500	13,400	<5	15	<10	<10	<10
1-H4-9	07JUN88		95	<30	15,700	15,300	<5	<5	#3	<10	<10
	07JUN88	1	.	<30	.	16,100	<5	.	#3	.	<10
	13JUL88		86	<30	18,700	18,100	<5	<5	<10	<10	<10
	10AUG88		61	<30	16,500	15,500	<5	<5	<10	<10	<10
1-H4-10	08JUN88		<30	<30	7,770	8,020	<5	<5	<10	<10	<10
1-H4-11	09JUN88		<30	<30	7,630	8,300	<5	<5	<10	<10	<10
	13JUL88		44	<30	7,480	7,610	<5	<5	<10	<10	<10
	09AUG88		41	<30	8,520	7,440	<5	<5	<10	<10	<10
1-H4-12A	06JUN88		<30	<30	6,810	6,620	<5	<5	<10	<10	<10
	12JUL88		<30	<30	10,900	11,400	<5	<5	<10	<10	<10
	08AUG88		<30	<30	12,600	12,300	<5	<5	<10	<10	<10
1-H4-12B	06JUN88		<30	<30	10,300	10,200	<5	<5	<10	<10	<10
	12JUL88		<30	<30	11,900	11,600	<5	<5	<10	<10	<10
	08AUG88		<30	<30	13,200	12,100	<5	<5	<10	<10	<10
1-H4-12C	06JUN88		<30	<30	11,500	11,700	<5	<5	190	24	25
	10JUN88		.	.	.	.	.	.	.	.	.
	12JUL88		68	<30	11,300	11,100	<5	<5	<10	23	14
	08AUG88		<30	<30	11,200	10,300	<5	<5	<10	16	<10
1-H4-13	09JUN88		122	<30	6,430	7,010	<5	<5	#6	<10	<10
1-H4-14	16JUN88		<30	<30	7,750	8,250	<5	<5	5500	<10	<10
	17JUN88		.	.	.	.	.	.	.	.	.
	14JUL88		<30	<30	8,020	7,410	<5	<5	<10	<10	<10
	10AUG88		<30	<30	8,920	7,680	<5	<5	<10	<10	<10
1-H4-15A	08JUN88		61	<30	10,300	10,700	<5	<5	12	<10	<10
1-H4-15B	08JUN88		42	33	12,300	13,200	8	6	<10	19	20
1-H4-16	15JUN88		.	.	.	.	.	.	.	.	.
1-H4-17	16JUN88		.	.	.	.	.	.	.	.	.
1-H4-18	10JUN88		<30	<30	8,340	8,950	<5	<5	<10	<10	<10
	13JUL88		53	<30	8,750	8,370	<5	<5	<10	<10	<10
	09AUG88		<30	<30	8,760	8,140	<5	<5	<10	<10	<10

TABLE 6. (contd)

Well name	Collection Date	Duplicate sample number	NITRATE ppb 500/45000	PERCENE ppb 5/.	PH-LAB 0.01/8.5s	PHFIELD 0.1/8.5s	FPOTASS ppb 100/.	POTASUM ppb 100/.	RADIUM pCi/L 1/5	RU-106 pCi/L 172.5/30r
1-H3-1	17JUN88		59,000	<5	7.7	7.6	6,750	7,260	*0.02760	*-25.8
1-H3-2A	14JUN88		17,100	<5	7.9	7.5	4,190	4,510	*0.11400	.
1-H3-2B	14JUN88		22,100	<5	8.0	7.8	4,550	5,420	*0.07050	.
1-H3-2C	14JUN88		3,310	<5	8.0	7.3	3,980	4,960	0.16100	.
1-H4-3	07JUN88		218,000	9	.	8.3	3,920	4,100	*-0.00129	*-47.2
	10JUN88		207,000	.	8.2	8.6	.	.	.	.
	14JUL88		480,000	<5	.	7.9	5,310	5,760	0.20300	.
	10AUG88		364,000	<5	8.0	7.8	5,260	5,430	*0.12100	.
1-H4-4	07JUN88		79,300	<5	8.0	8.0	4,020	4,690	*0.10100	.
	07JUN88	1	79,800	<5	.	.	4,320	.	.	.
	14JUL88		197,000	<5	8.0	8.2	5,350	4,710	*-0.03420	.
	14JUL88	1	202,000	<5	.	.	5,080	.	.	.
	09AUG88		255,000	<5	7.9	7.5	5,320	5,360	*0.00362	.
	09AUG88	1	271,000	<5	.	.	5,920	.	.	.
1-H4-5	13JUN88		39,500	<5	7.6	7.7	5,780	5,370	*0.07110	.
1-H4-6	15JUN88		38,900	#3	7.8	7.4	5,810	6,530	*0.09770	.
1-H4-7	13JUN88		36,600	<5	7.7	7.3	6,260	6,040	*0.12700	.
1-H4-8	13JUN88		38,400	<5	7.7	7.5	5,520	5,420	*0.14700	.
1-H4-9	07JUN88		63,600	<5	7.7	7.7	5,650	5,420	0.17200	.
	07JUN88	1	62,800	<5	.	.	6,030	.	.	.
	13JUL88		127,000	<5	7.7	8.2	5,890	6,050	*0.12300	.
	10AUG88		113,000	<5	7.8	7.3	5,700	6,370	*0.03030	.
1-H4-10	08JUN88		9,620	<5	7.4	7.6	3,750	3,720	*0.06540	.
1-H4-11	09JUN88		29,500	<5	7.8	7.8	3,090	2,860	*0.11400	.
	13JUL88		28,800	<5	7.9	8.1	2,820	2,660	*-0.05540	.
	09AUG88		26,300	<5	7.9	7.5	2,750	3,280	*0.04270	.
1-H4-12A	06JUN88		15,300	<5	7.9	7.9	3,830	4,230	*0.08310	.
	12JUL88		58,700	<5	7.9	7.9	5,290	5,160	0.43400	.
	08AUG88		119,000	<5	7.8	7.6	6,290	6,420	*0.01810	.
1-H4-12B	06JUN88		35,300	<5	7.8	7.8	4,730	4,970	*-0.04620	.
	12JUL88		44,400	<5	7.9	7.9	5,110	5,320	0.72200	.
	08AUG88		72,600	<5	7.8	7.4	5,520	6,060	*0.08130	.
1-H4-12C	06JUN88		6,210	<5	7.9	7.6	4,620	4,700	*-0.01690	.
	10JUN88		.	.	.	8.4	.	.	.	.
	12JUL88		5,710	<5	8.0	7.8	4,660	4,770	*-0.00003	.
	08AUG88		6,210	<5	7.9	7.6	4,500	5,110	*-0.08180	.
1-H4-13	09JUN88		14,600	<5	7.6	7.5	2,320	2,140	*0.01130	.
1-H4-14	16JUN88		17,000	<5	7.9	7.5	4,320	4,250	*0.07180	.
	17JUN88		.	.	.	8.0	.	.	.	.
	14JUL88		17,400	<5	7.9	7.8	3,820	4,160	*0.07140	.
	10AUG88		18,600	<5	8.0	7.8	3,910	4,700	*0.03680	.
1-H4-15A	08JUN88		24,200	<5	7.5	7.5	5,470	5,360	*0.00358	.
1-H4-15B	08JUN88		27,000	<5	7.6	7.7	6,090	5,620	0.19100	.
1-H4-16	15JUN88		.	.	.	7.4	.	.	.	.
1-H4-17	16JUN88		.	.	.	7.1	.	.	.	.
1-H4-18	10JUN88		22,600	<5	7.8	8.2	4,410	4,190	*0.02340	.
	13JUL88		21,500	<5	7.9	8.1	4,110	4,170	*0.03640	.
	09AUG88		21,000	<5	7.9	7.4	4,110	4,640	0.14400	.

TABLE 6. (contd)

Well name	Collection Date	Duplicate sample number	SELENUM ppb 5/10	SODIUM ppb 200/.	FSODIUM ppb 200/.	SR-90 pCi/L 5/8	FSTRONT ppb 20/.	STRONUM ppb 20/.	SULFATE ppb 500/250000s	TC ppb 1000/.	TC-99 pCi/L 15/900r
1-H3-1	17JUN88		<5.0	23,500	20,600	*0.387	472	466	73,600	44,900	7.71
1-H3-2A	14JUN88		<5.0	11,400	11,300	.	217	210	38,600	25,100	*6.08
1-H3-2B	14JUN88		<5.0	12,000	10,700	.	263	253	48,600	27,500	*6.35
1-H3-2C	14JUN88		<5.0	13,400	11,600	.	183	171	21,600	24,200	*4.91
1-H4-3	07JUN88		<5.0	183,000	194,000	0.699	83	85	88,300	37,600	1,320.00
	10JUN88		.	.	.	.	.	.	81,100	.	.
	14JUL88		<5.0	260,000	239,000	.	164	168	94,400	40,000	3,460.00
	10AUG88		<5.0	217,000	211,000	.	138	161	94,700	34,800	1,780.00
1-H4-4	07JUN88		<5.0	46,500	42,400	.	191	199	46,400	26,700	426.00
	07JUN88	1	.	.	41,400	.	194	.	46,100	.	.
	14JUL88		<5.0	119,000	131,000	.	190	167	60,400	34,900	1,320.00
	14JUL88	1	.	.	133,000	.	186	.	62,300	.	.
	09AUG88		<5.0	135,000	137,000	.	197	201	69,100	31,100	.
	09AUG88	1	.	.	144,000	.	219	.	73,900	.	1,320.00
1-H4-5	13JUN88		<5.0	12,200	13,500	.	361	330	72,300	33,000	*4.79
1-H4-6	15JUN88		<5.0	25,600	23,500	.	367	337	91,600	33,800	*4.48
1-H4-7	13JUN88		<5.0	13,400	14,700	.	349	336	85,700	32,000	*2.38
1-H4-8	13JUN88		<5.0	12,900	13,900	.	352	321	74,000	34,200	*1.10
1-H4-9	07JUN88		<5.0	24,300	25,100	.	359	359	71,100	38,000	250.00
	07JUN88	1	.	.	26,600	.	370	.	70,600	.	.
	13JUL88		5.4	25,900	26,700	.	452	468	83,500	50,600	42.70
	10AUG88		<5.0	30,100	26,100	.	397	437	81,900	40,000	496.00
1-H4-10	08JUN88		<5.0	10,400	10,600	.	164	164	27,700	24,700	*2.89
1-H4-11	09JUN88		<5.0	8,650	9,610	.	250	228	40,800	26,800	66.00
	13JUL88		<5.0	8,220	9,140	.	228	227	40,100	29,800	*1.50
	09AUG88		<5.0	9,000	7,420	.	218	269	38,400	26,100	4.15
1-H4-12A	06JUN88		<5.0	12,100	11,400	.	176	187	30,800	24,800	24.90
	12JUL88		<5.0	15,300	16,700	.	332	317	57,900	36,500	121.00
	08AUG88		<5.0	30,100	29,600	.	383	400	71,400	34,500	672.00
1-H4-12B	06JUN88		<5.0	11,900	12,300	.	285	289	56,000	30,700	76.70
	12JUL88		<5.0	12,400	12,500	.	326	339	58,500	37,300	125.00
	08AUG88		<5.0	16,900	15,600	.	354	389	66,800	33,000	331.00
1-H4-12C	06JUN88		<5.0	4,380	4,520	.	212	217	23,900	24,500	*3.33
	10JUN88		.	.	.	.	.	.	.	.	.
	12JUL88		<5.0	4,280	4,430	.	212	218	23,200	26,800	*0.61
	08AUG88		<5.0	4,850	4,050	.	192	226	25,500	23,100	4.37
1-H4-13	09JUN88		<5.0	6,070	6,880	.	180	168	29,800	22,600	*2.88
1-H4-14	16JUN88		<5.0	8,030	8,010	.	201	193	37,400	24,000	*3.75
	17JUN88		.	.	.	.	.	.	.	.	.
	14JUL88		<5.0	7,900	7,340	.	184	198	37,200	26,000	*1.37
	10AUG88		<5.0	8,490	6,920	.	190	234	39,900	23,800	3.45
1-H4-15A	08JUN88		<5.0	11,000	11,600	.	246	243	45,300	29,100	*1.70
1-H4-15B	08JUN88		<5.0	11,100	12,100	.	287	278	48,500	30,500	7.25
1-H4-16	15JUN88		.	.	.	.	.	.	.	.	.
1-H4-17	16JUN88		.	.	.	.	.	.	.	.	.
1-H4-18	10JUN88		<5.0	10,000	10,900	.	239	222	38,800	27,100	36.20
	13JUL88		<5.0	9,820	9,900	.	222	235	38,400	30,600	22.00
	09AUG88		<5.0	10,600	9,060	.	212	242	39,000	27,700	9.72

TABLE 6. (contd)

Well name	Collection Date	Duplicate sample number	TDS ppb 5000/500000s	TOC ppb 1000/.	TOX ppb 100/.	U-CHEM ug/L 0.725/.	FVANADI ppb 5/.	VANADUM ppb 5/.	ZINC ppb 5/5000s	FZINC ppb 5/5000s
1-H3-1	17JUN88		428,000	#980	#16.2	7.30	10	9	<5	<5
1-H3-2A	14JUN88		219,000	#668	#28.3	2.22	9	8	8	<5
1-H3-2B	14JUN88		252,000	#798	#20.8	3.47	6	7	<5	<5
1-H3-2C	14JUN88		182,000	#486	#9.3	1.31	20	17	7	<5
1-H4-3	07JUN88		.	#938	#16.0	93.60	7	6	<5	<5
	10JUN88		.	.	.	.	.	.	.	.
	14JUL88		.	1,200	#19.8	164.00	10	6	<5	5
	10AUG88		854,000	32,100	#15.7	145.00	<5	7	10	<5
1-H4-4	07JUN88		300,000	#778	#78.0	38.00	5	<5	101	73
	07JUN88	1	.	.	.	27.60	8	.	.	70
	14JUL88		478,000	#808	#17.4	74.20	5	5	72	84
	14JUL88	1	.	.	.	63.50	9	.	.	91
	09AUG88		630,000	1,020	#34.0	122.00	<5	<5	114	122
	09AUG88	1	.	.	.	120.00	<5	.	.	148
1-H4-5	13JUN88		337,000	#818	#7.5	3.68	9	<5	228	173
1-H4-6	15JUN88		386,000	1,170	720.0	5.14	<5	<5	178	243
1-H4-7	13JUN88		356,000	#797	#15.4	4.22	9	<5	9	5
1-H4-8	13JUN88		331,000	#954	#19.3	4.91	7	<5	8	<5
1-H4-9	07JUN88		406,000	#919	#10.0	6.21	7	<5	<5	<5
	07JUN88	1	.	.	.	6.19	8	.	.	<5
	13JUL88		248,000	1,120	#10.8	9.83	<5	<5	6	<5
	10AUG88		460,000	1,050	#23.0	6.82	<5	6	8	<5
1-H4-10	08JUN88		174,000	#701	#-0.8	1.18	9	6	11	<5
1-H4-11	09JUN88		254,000	#666	#32.2	4.67	<5	6	<5	<5
	13JUL88		229,000	#740	#53.0	3.85	7	7	<5	<5
	09AUG88		226,000	#799	#1.5	4.11	<5	<5	9	<5
1-H4-12A	06JUN88		166,000	#850	#14.0	5.04	7	6	<5	<5
	12JUL88		341,000	#856	#8.3	12.40	<5	<5	<5	9
	08AUG88		440,000	1,390	#16.8	37.40	<5	<5	<5	<5
1-H4-12B	06JUN88		269,000	#818	#14.0	5.21	6	6	6	6
	12JUL88		332,000	#873	#14.7	5.72	<5	7	5	6
	08AUG88		402,000	1,070	#19.7	9.65	<5	5	6	<5
1-H4-12C	06JUN88		167,000	#381	157.0	1.73	28	25	5	7
	10JUN88		.	.	.	.	.	.	.	.
	12JUL88		189,000	#378	#11.1	1.48	30	26	6	8
	08AUG88		197,000	#370	#6.4	1.52	11	29	13	16
1-H4-13	09JUN88		167,000	#710	#34.6	1.70	<5	<5	11	<5
1-H4-14	16JUN88		236,000	#890	5,660.0	2.26	<5	9	<5	<5
	17JUN88		.	.	.	.	.	.	.	.
	14JUL88		211,000	#645	#41.9	2.26	9	6	<5	<5
	10AUG88		208,000	#914	#37.9	2.51	<5	7	9	<5
1-H4-15A	08JUN88		262,000	#875	#2.5	2.02	9	6	5	<5
1-H4-15B	08JUN88		239,000	#592	#18.7	2.36	11	11	17	18
1-H4-16	15JUN88		.	.	.	.	.	.	.	.
1-H4-17	16JUN88		.	.	.	.	.	.	.	.
1-H4-18	10JUN88		224,000	#722	#26.8	2.42	<5	7	6	6
	13JUL88		231,000	#693	#26.7	2.82	9	<5	<5	<5
	09AUG88		217,000	#791	#17.2	2.86	<5	<5	5	<5

TABLE 6. (contd)

The column headers consist of : Constituent Name
Analysis Units
Contractual Detection Limit/Drinking Water Standard(suffix)

Suffix
none - based on Maximum Contaminant Levels given in 40 CFR Part 141 (July,1987) National Primary Drinking Water Regulations as amended by 52 FR 25690
r - based on National Interim Primary Drinking Water Regulations, Appendix IV, EPA-570/9-76-003
p - based on proposed Maximum Contaminant Level Goals in 50 FR 46936
s - based on Secondary Maximum Contaminant Levels given in 40 CFR Part 143 (July, 1987) National Secondary Drinking Water Regulations
w - based on additional Secondary Maximum Contaminant Levels given in WAC 248-54, Public Water Supplies

Data flags
< - Less than Contractual Detection Limit, reported as Limit
- Less than Contractual Detection Limit, measured value reported
* - For radioactive constituents, reported value is less than 2-sigma error

200 AREA LOW-LEVEL BURIAL GROUNDS

G. V. Last

This RCRA interim-status detection-level ground-water monitoring project encompasses four waste management units covering all or portions of six low-level burial grounds (LLBG) located in the 200-East and -West Areas of the Hanford Site (Figure 8). This project includes 16 ground-water monitoring wells in the 200-East Area and 19 in the 200-West Area. The objectives of this project are to 1) characterize the hydrogeology of the burial grounds and 2) determine if contaminants have entered the ground-water system from the LLBG. The LLBG Ground-Water Monitoring Compliance Plan is based on RCRA, 40 CFR 265, Subpart F, and describes how the program objectives will be met.

Work performed in the second quarter of 1988 (PNL 1988d) focused on activities associated with hydrogeologic characterization. In the third quarter of 1988, activities included well redevelopment, sample pump installation, physical and mineralogical analyses of borehole samples, monthly water-level measurements, and revision of the LLBG interim characterization report. Ground-water sampling has begun, and the results will be included in next quarter's report

DRILLING AND HYDROGEOLOGIC CHARACTERIZATION

No drilling was conducted during this quarter. However, most of the wells in the ground-water monitoring network were redeveloped because of high turbidity levels. In addition, sediment analyses were performed, and water levels were measured.

Thirty-two of the 35 LLBG monitoring wells (see Figures 9 and 10) were redeveloped by overpumping, using a 1.5-hp submersible pump. Well 299-E34-2 was redeveloped using a HydroStar[a] pump because of the well's smaller access. This work was completed on September 27, 1988. Wells 299-E34-4 and 299-E34-6 were not redeveloped because the first well had insufficient water and the second was dry.

(a) HydoStar is the tradename of Instrumentation Northwest, Incorporated, Redmond, Washington.

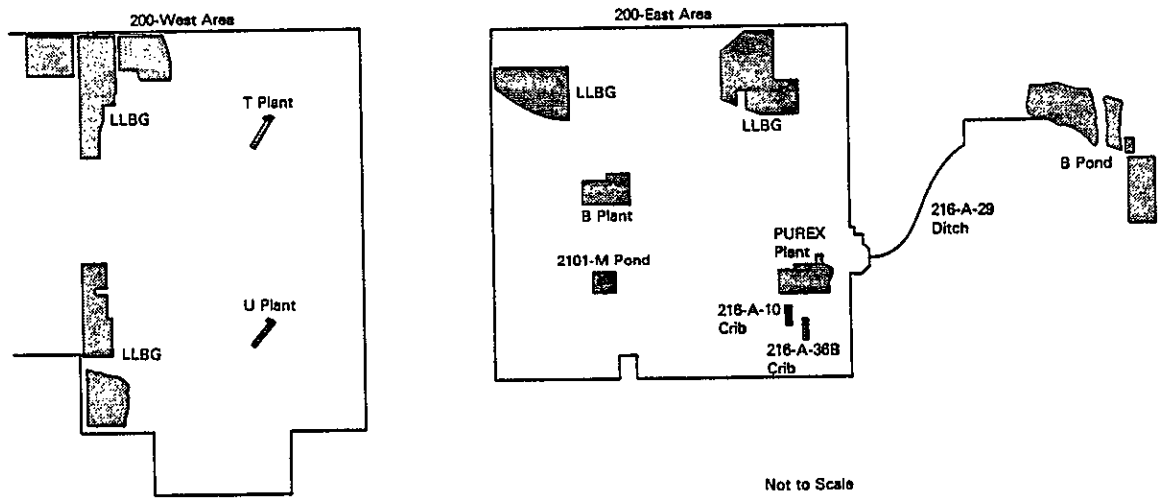


FIGURE 8. Resource Conservation and Recovery Act Ground-Water Monitoring Projects in the 200 Areas, September 1988

Tables 7 and 8 list the pertinent development information for each well. Following the redevelopment, a HydroStar sampling pump was installed in each well.

Hydrogeologic Characterization

The PNL Soil Physics laboratory completed hydrogeologic property analyses on selected borehole samples from the LLBG monitoring wells. Fifteen drive-barrel samples, covering a representative suite of soils, were analyzed for water retention characteristics and saturated hydraulic conductivity. Three split-barrel samples of the lower Ringold clay beneath the 200-West Area were analyzed for saturated hydraulic conductivity and complete particle-size distribution (Table 9).

Geochemical soil characterization is currently under way, including mineralogical analyses [petrography, x-ray diffraction (XRD)], bulk soil chemical analyses [x-ray fluorescence (XRF), total carbon and total inorganic carbon], and cation exchange capacity measurements on a series of soil samples. These results will be reported when available.

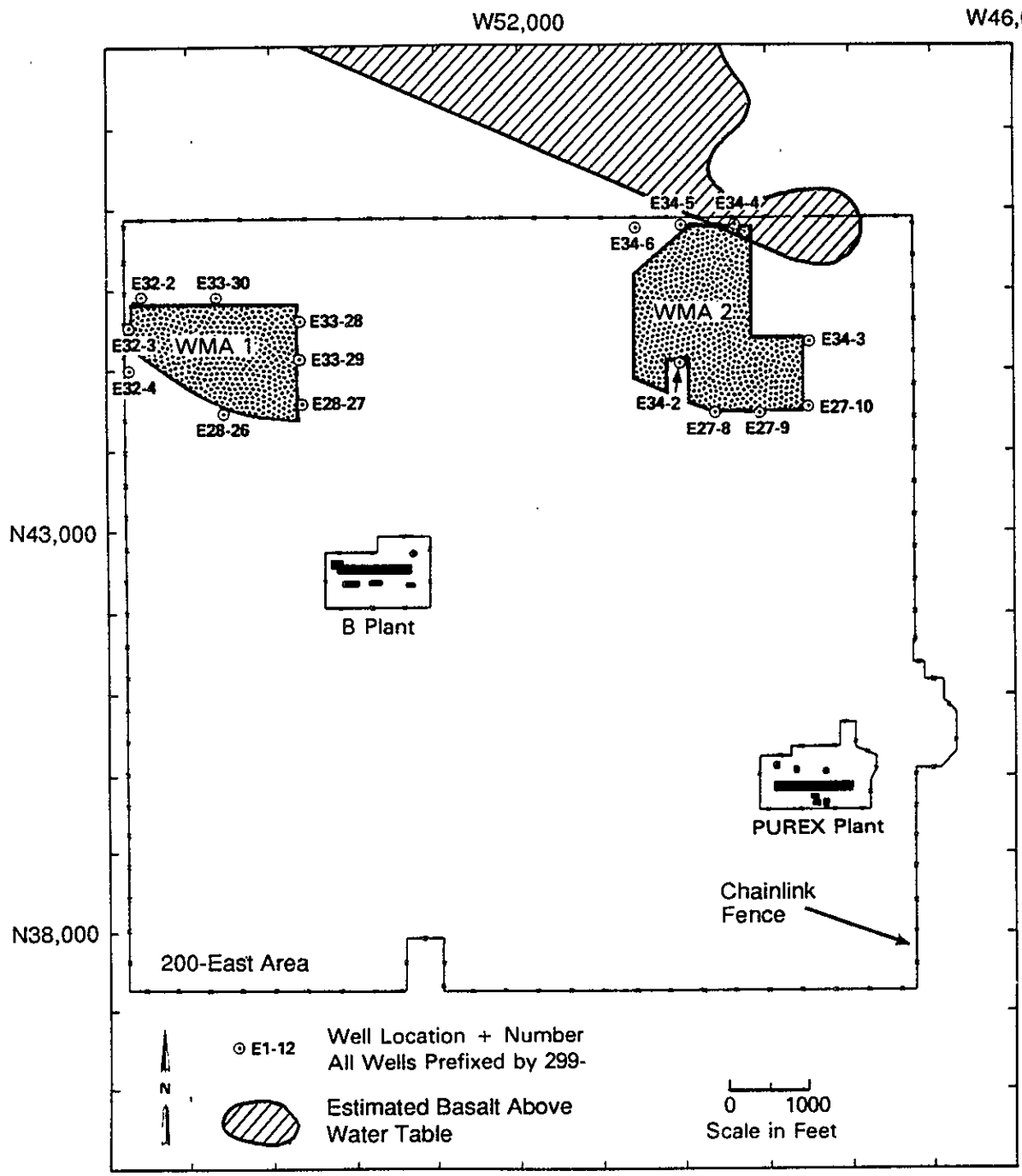


FIGURE 9. Monitoring Well Locations for the 200-East Area Low-Level Burial Grounds

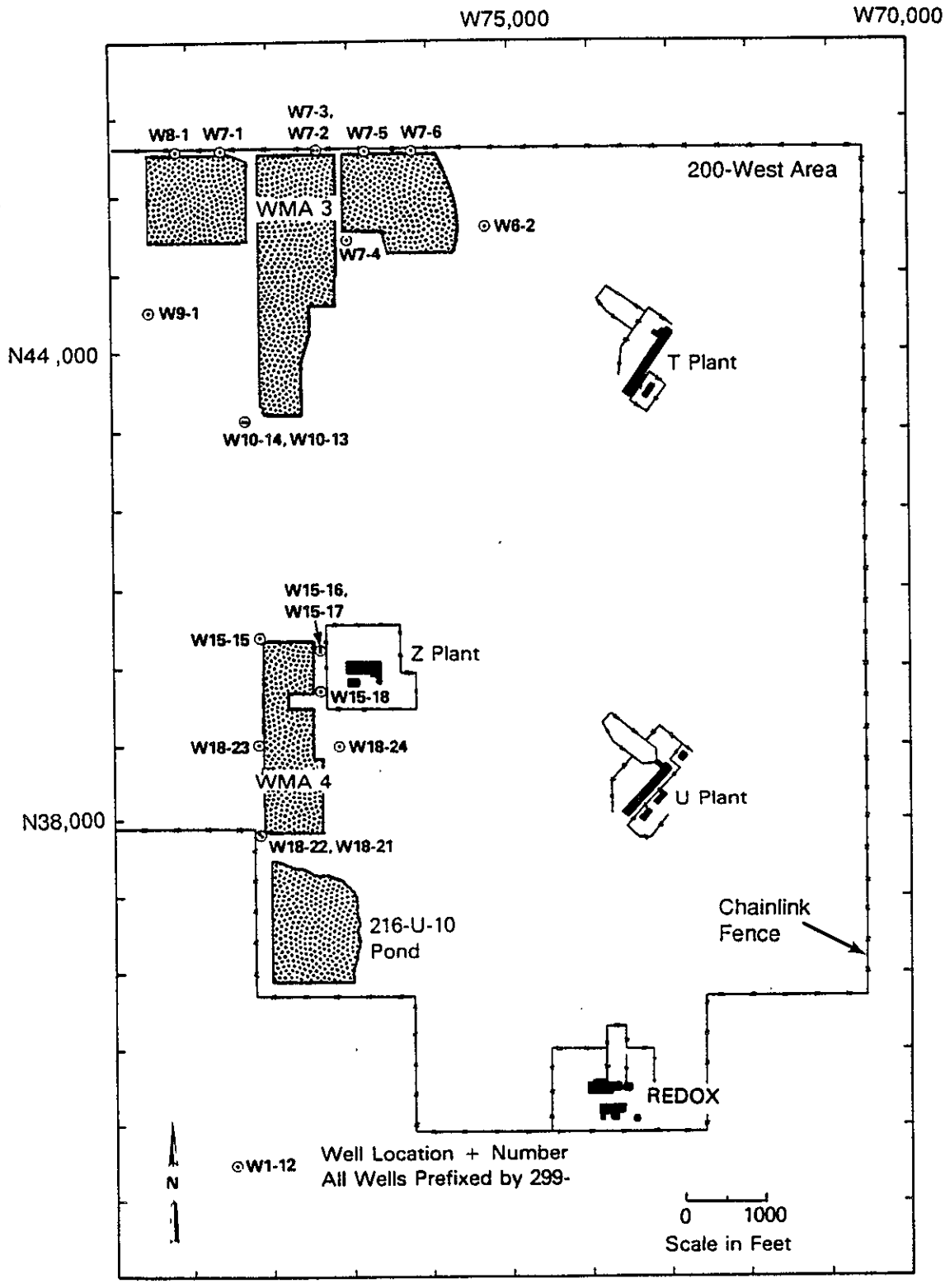


FIGURE 10. Monitoring Well Locations for the 200-West Area Low-Level Burial Grounds

TABLE 7. Well Development of the 200-East Area Low-Level Burial Grounds Monitoring Wells

Well Number	Date Developed	Pumping Rate (gpm)	Duration of Pumping (m)	Total Volume (g)	Initial Turbidity (NTU)	Final Turbidity (NTU)	Comments
299-E27-8	9-12-88	11	49	539	3.5	0.18	
299-E27-9	9-08-88	12.5	45	562.5	66.0	0.70	
299-E27-10	9-08-88	11	46	506	33.0	1.70	
299-E28-26	9-01-88	11.5	45	517.5	62.0	1.47	
299-E28-27	8-31-88	11.5	67	772	11.5	1.52	
299-E32-2	8-26-88	12	45	540	>200	2.30	
299-E32-3	8-25-88	10	45	450	6.0	0.60	
299-E32-4	8-25-88	12	40	480	>200	2.20	
299-E33-28	8-29-88	12	32	384	25.0	3.80	
299-E33-29	8-31-88	10	45	450	70.0	0.63	
299-E33-30	8-29-88	12.0	43	516	17.9	0.30	
299-E34-2	9-12-88	4.2	30	125	--	5.30[a]	Developed using HydroStar
299-E34-3	9-07-88	11	50	550	72.0	0.70	
299-E34-4	NA	--	--	--	--	--	Dry
299-E34-5	9-06-88	14	45	630	135.	2.00	
299-E34-6	9-06-88	--	--	--	--	--	Too little water

(a) Exceeds 5-NTU guideline.

TABLE 8. Well Development of the 200-West Area Low-Level Burial Grounds Monitoring Wells

Well Number	Date Developed	Pumping Rate (gpm)	Duration of Pumping (m)	Total Volume (g)	Initial Turbidity (NTU)	Final Turbidity (NTU)	Comments
299-W6-2	9-27-88	8.8	40	352	6.6	4.4	
299-W7-1	9-21-88	10.7	60	642	10.0	0.73	
299-W7-2	9-16-88	11.0	128	1408	09.0	--(a)	
	9-19-88	10.9	143	1559	--	7.8(b)	
299-W7-3	9-20-88	10.5	90	950	34.0	3.3	
299-W7-4	9-16-88	10.4	40	416	3.4	3.3	
299-W7-5	9-15-88	8.6	154	1326	8.7	1.8	
299-W7-6	9-13-88	1.25	275	343	>300	--	
	9-14-88	1.45	352	510	--	7.3(a)	
299-W8-1	9-22-88	7.4	135	1002	11.0	3.1	
299-W9-1	9-23-88	1.6	547	875	6.6	--	
	9-24-88	1.6	316	505	--	--	
	9-25-88	1.1	70	79	--	6.1(a)	
299-W10-13	9-22-88	13.2	34	451	3.4	2.2	
299-W10-14	9-23-88	10.3	335	3447	18.0	4.5	
299-W15-15	9-24-88	10.4	36	373	1.3	1.7	
299-W15-16	9-24-88	14.7	53	782	3.6	2.9	
299-W15-17	9-24-88	8.5	301	2558	20.0	4.6	Wood obstruction at top of screen
299-W15-18	9-25-88	13.8	190	2631	1.3	1.3	
299-W18-21	9-26-88	11.1	62	691	10.0	3.1	
299-W18-22	9-26-88	9.3	194	1804	8.0	4.4	
299-W18-23	9-27-88	11.0	90	990	11.0	4.2	
299-W18-24	9-26-88	11.5	34	391	7.4	2.0	

(a) Duplicate sampling.
(b) Exceeds 5-NTU guideline.

TABLE 9. Particle-Size and Hydraulic Conductivity Values of Lower Ringold Formation Samples from Beneath the 200-West Area

Sample No.	% Sand	% Silt	% Clay	Hydraulic Conductivity (cm/sec)
W10-14 460-462′	29	44	27	2.69E-08
W15-17 448-450′	25	32	43	6.43E-09
W18-22 455-456.5′	22	43	35	2.17E-08

Water levels are being measured monthly at each new well. Three sets of measurements were collected during this quarter and are listed in Tables 10 and 11 for the 200-East and 200-West Areas, respectively. Water table maps from measurements made on September 28 and 30, 1988, are shown in Figures 11 and 12.

Ground-water sampling was initiated in late September and will be completed by mid-October 1988. Results will be reported in the next quarterly report.

TABLE 10. Water-Level Data for Monitoring Wells in the 200-East Area Low-Level Burial Grounds

Well Number	Measurement Date	Depth to Water from Top of Casing (ft)	Water Table Elevation (ft above MSL)[a]
299-E27-8	7/27/88	637.83	405.50
	8/29/88	637.83	405.64
	9/28/88	637.83	405.81
299-E27-9	7/27/88	629.21	405.66
	8/29/88	629.21	405.85
	9/28/88	629.21	406.00
299-E27-10	7/27/88	624.47	406.14
	8/29/88	624.47	406.42
	9/28/88	624.47	406.58
299-E28-26	7/27/88	687.26	405.16
	8/29/88	687.26	405.26
	9/28/88	687.26	405.49
299-E28-27	7/27/88	680.37	405.15
	8/29/88	680.37	405.26
	9/28/88	680.37	405.47
299-E-32-2	7/27/88	670.06	404.92
	8/29/88	670.06	405.01
	9/28/88	670.06	405.21
299-E-32-3	7/27/88	676.51	404.98
	8/29/88	676.51	405.08
	9/28/88	676.51	405.27
299-E32-4	7/27/88	685.88	404.85
	8/29/88	685.88	404.98
	9/28/88	685.88	405.14
299-E33-28	7/27/88	664.23	405.18
	8/29/88	664.23	405.28
	9/28/88	664.23	405.50
299-E33-29	7/27/88	673.77	415.16
	8/29/88	673.77	405.29
	9/28/88	673.77	404.92[b]
299-E33-30	7/27/88	663.70	405.10
	8/29/88	663.70	405.21
	9/28/88	663.70	405.39

(a) MSL = mean sea level.
(b) No weight used.

TABLE 10. (contd)

Well Number	Measurement Date	Depth to Water from Top of Casing (ft)	Water Table Elevation (ft above MSL)[a]
299-E34-2	7/27/88	630.80	405.48
	8/29/88	630.80	405.63
	9/28/88	630.80	405.79
299-E34-3	7/27/88	611.52	406.22
	8/29/88	611.52	406.46
	9/28/88	611.52	406.67
299-E34-5	7/27/88	590.79	406.16
	8/29/88	590.79	406.28
	9/28/88	590.79	406.46
299-E34-6	7/27/88	597.83	405.41
	8/29/88	597.83	405.55
	9/28/88	597.83	405.69

(a) MSL = mean sea level.
(b) No weight used.

TABLE 11. Water-Level Data for Monitoring Wells in the 200-West Area Low-Level Burial Grounds

Well Number	Measurement Date	Depth to Water from Top of Casing (ft)	Water Table Elevation (ft above MSL)(a)
299-W6-2	7/28/88	692.45	461.88
	8/31/88	692.45	461.89
	9/30/88	692.45	461.86
299-W7-1	7/28/88	690.71	461.79
	8/31/88	690.71	461.80
	9/30/88	690.71	461.76
299-W7-2	7/28/88	675.59	460.83
	8/31/88	675.59	460.85
	9/30/88	675.59	460.81
299-W7-3	7/28/88	676.14	459.56
	8/31/88	676.14	459.60
	9/30/88	676.14	459.60
299-W7-4	7/28/88	671.69	463.14
	8/31/88	671.69	463.14
	9/30/88	671.69	463.13
299-W7-5	7/28/88	673.03	460.40
	8/31/88	673.03	460.37
	9/30/88	673.03	460.38
299-W7-6	7/28/88	678.64	460.34
	8/31/88	678.64	460.33
	9/30/88	678.64	460.27
299-W8-1	7/28/88	701.33	462.17
	8/31/88	701.33	462.20
	9/30/88	701.33	462.16
299-W9-1	7/28/88	737.73	465.30
	8/31/88	737.73	465.30
	9/28/88	737.73	465.03
299-W10-13	7/28/88	699.04	466.73
	8/31/88	699.04	466.72
	9/28/88	699.04	466.50
299-W10-14	7/28/88	699.43	466.33
	8/31/88	699.43	466.32
	9/28/88	699.43	466.06

(a) MSL = mean sea level

TABLE 11. (contd)

Well Number	Measurement Date	Depth to Water from Top of Casing (ft)	Water Table Elevation (ft above MSL)(a)
299-W15-15	7/28/88	697.96	469.52
	8/31/88	697.96	469.47
	9/28/88	697.96	469.19
299-W15-16	7/28/88	684.89	470.40
	8/31/88	684.89	470.32
	9/28/88	684.89	470.05
299-W15-17	7/28/88	684.64	470.17
	8/31/88	684.64	470.10
	9/30/88	684.64	469.82
299-W15-18	7/28/88	685.71	470.79
	8/31/88	685.71	470.70
	9/28/88	685.71	470.42
299-W18-21	7/28/88	668.62	469.88
	8/31/88	668.62	469.80
	9/28/88	668.62	469.48
299-W18-22	7/28/88	668.49	468.97
	8/31/88	668.49	468.93
	9/28/88	668.49	468.52
299-W18-23	7/28/88	696.81	469.87
	8/31/88	696.81	469.79
	9/30/88	696.81	469.80
299-W18-24	7/28/88	684.35	471.07
	8/31/88	684.35	470.98
	9/28/88	684.35	470.71

(a) MSL = mean sea level

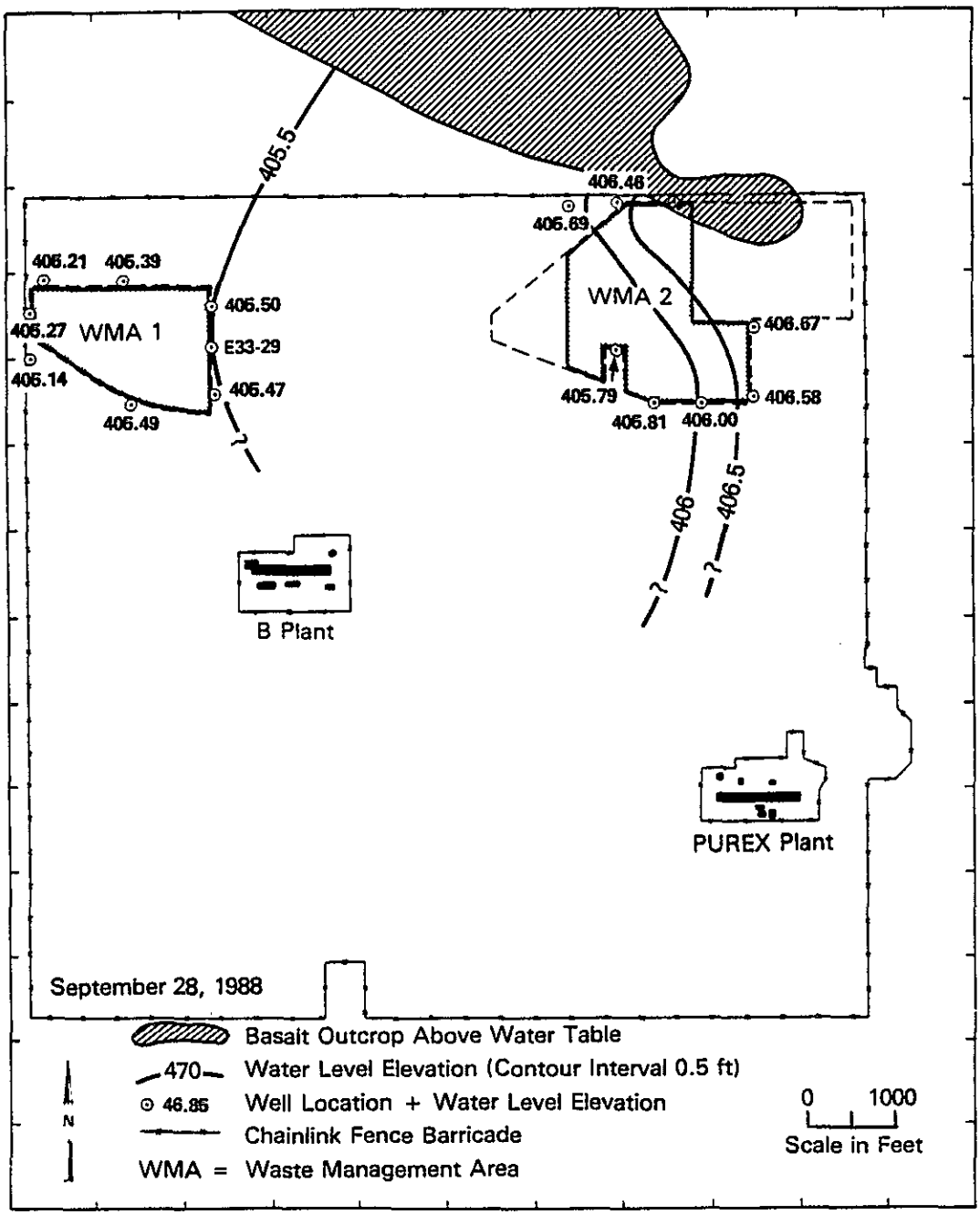


FIGURE 11. Water Table Map for the 200-East Area Low-Level Burial Grounds, September 28, 1988

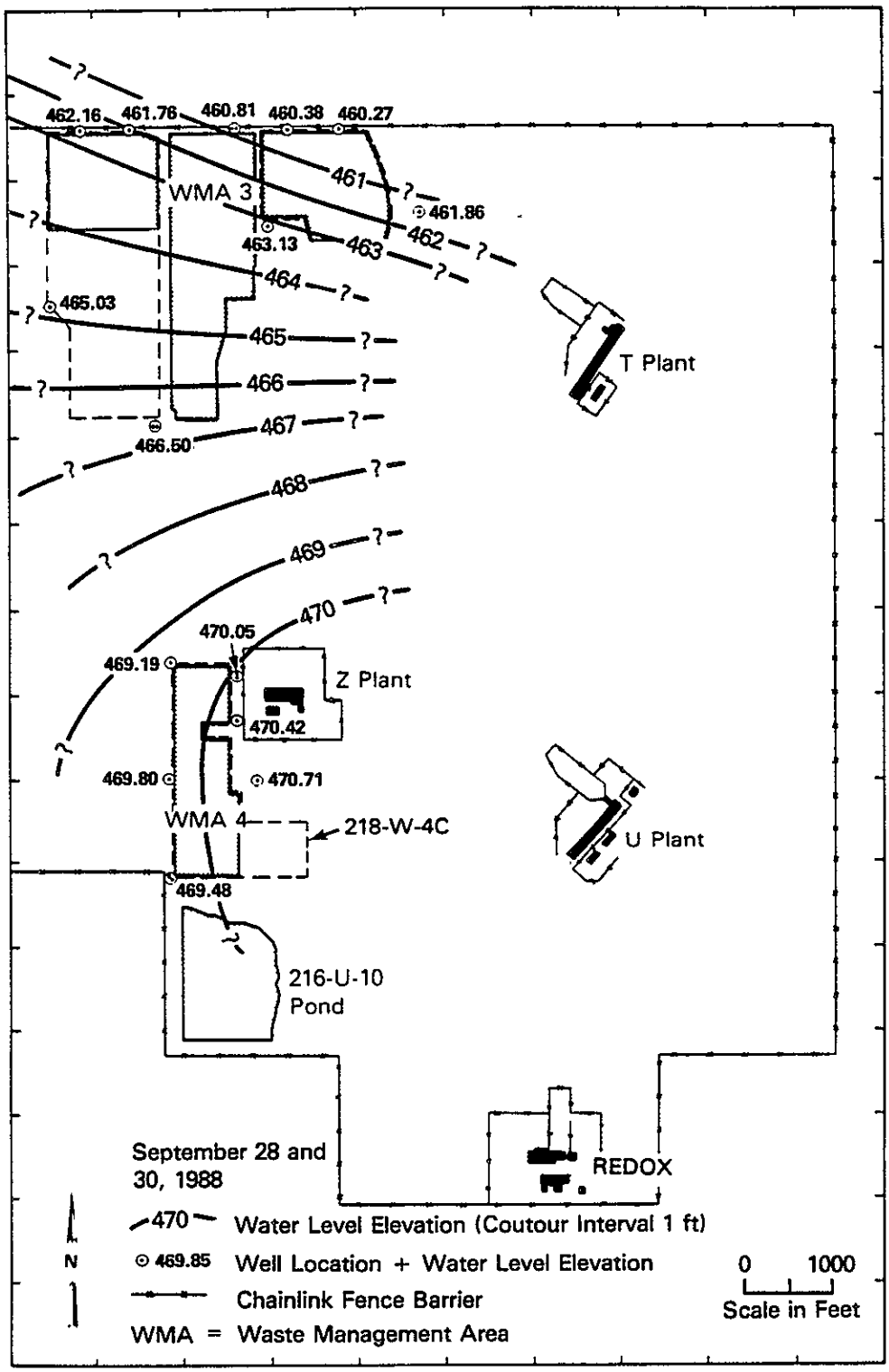


FIGURE 12. Water Table Map for the 200-West Area Low-Level Burial Grounds, September 28 and 30, 1988

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NONRADIOACTIVE DANGEROUS WASTE LANDFILL

R. M. Fruland

Activities conducted during this reporting period include completion of quarterly sampling and analysis of ground water from monitoring wells at the Nonradioactive Dangerous Waste Landfill (NRDW). This is the eighth quarterly sampling for the five shallow wells completed in the top of the unconfined aquifer and the seventh quarterly sampling for the two deep monitoring wells completed just above the first confining layer. The data presented here have been statistically analyzed using the first year's data from the upgradient wells in accordance with 40 CFR 265.93(b) to determine if contamination indicators in upgradient and downgradient wells have changed significantly from background conditions. The NRDW is adjacent to the Solid Waste Landfill (SWL). The locations of the wells monitoring both the NRDW and SWL are shown in Figure 13.

DRILLING AND HYDROGEOLOGIC CHARACTERIZATION

No additional drilling is planned at the NRDW. However, beginning in April 1988, water-level measurements have been taken monthly in an effort to more accurately determine the direction of ground-water flow.

Hydrogeologic Characterization

Water-levels were measured monthly in all six SWL wells, four shallow NRDW wells, and six nearby Hanford Site wells through September 1988. These data, which are still being evaluated, show an extremely flat gradient in the vicinity of the NRDW and SWL and continue to support the previously determined general ground-water flow direction of northwest to southeast. However, it is apparent that there are inconsistencies in some of the casing elevations from which water levels are calculated. In particular, the casing elevations of the older wells may not be as accurate or precise as those of the newer SWL and NRDW wells. The six sets of water-level data are being evaluated to determine if the older Hanford wells need to be resurveyed to

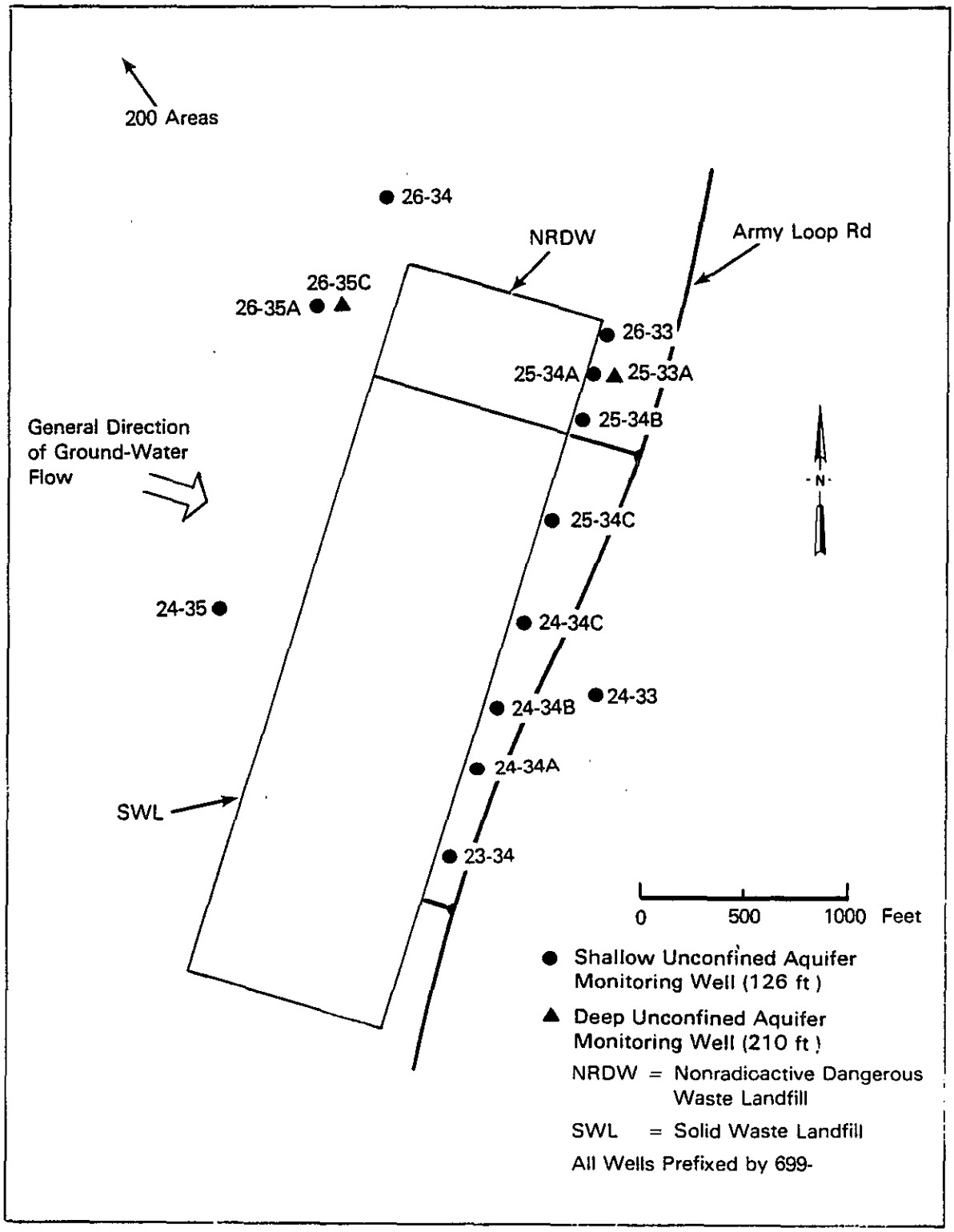

FIGURE 13. Monitoring Well Locations for the Solid Waste Landfill and the Nonradioactive Dangerous Waste Landfill

interpret the ground-water flow direction. The water level data will be reported as soon as the accuracy and precision of the survey data are determined and appropriate action is taken.

GROUND-WATER SAMPLING AND ANALYSIS

All seven ground-water monitoring wells at the NRDW were sampled the last week of July 1988. Field measurements, including water-table elevation, temperature, conductivity, and pH, were made immediately before sample collection. Samples were collected for laboratory conductivity, laboratory pH, total organic carbon (TOC), and total organic halogens (TOX). A "lower" detection limit of 20 ppb is reported for TOX, and therefore the heading "TOXLDL" is used in the data tables discussed below.

Collection and Analysis

The analytical data collected this quarter are summarized by group. The field and laboratory measurements for pH and conductivity, along with TOC and TOXLDL, were collected in quadruplicate, and together are referred to as the "contamination indicator parameters [40 CFR 265.92(b)(3)]." The next analytical constituent group is the "drinking water parameters," based Appendix III, U.S. Environmental Protection Agency (EPA) Interim Primary Drinking Water Standards (40 CFR 265). Water quality parameters are the next constituent group, based on 40 CFR 265.92(b)(2). The last group includes site-specific constituents and additional parameters.

Discussion of Results

Table 13, beginning with the quadruplicate contamination indicator parameters, contains the raw data for constituents that had at least one detected value. The upgradient well data are given first, which include two shallow and one deep monitoring wells. Data from the four downgradient wells are listed next, which include three shallow and one deep monitoring wells.

The TOXLDL data from the resampling of well 699-25-34B are included with the indicator parameter data collected in July. As was reported last quarter, the resampling found no problem, and analysis found no anomalous values.

TABLE 12. Summary of Sampling Results for the Nonradioactive Dangerous Waste Landfill, July 1988

Constituent List=Contamination Indicator Parameters

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standard	Water Standards Agency Exceeded		Full name
088	CONDLAB	umho	.	28	0		700	WDOE		Specific conductance, laboratory
191	CONDFLD	umho	1	29	0		700	WDOE		Specific conductance, field
199	PHFIELD		0.1	29	0		8.5	EPAS		pH, field
207	PH-LAB		0.01	28	0		8.5	EPAS		pH, laboratory
C69	TOC	ppb	1000	28	0		.			Total organic carbon
H42	TOXLDL	ppb	20	32	0		.			Total organic halogens, low DL

Constituent List=Drinking Water Parameters

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standard	Water Standards Agency Exceeded		Full name
109	COLIFRM	MPN	2.2	7	7	***	1	EPA		Coliform bacteria
111	BETA	pCi/L	8	7	0		50	EPA		Gross beta
212	ALPHA	pCi/L	4	7	0		15	EPA		Gross alpha
A06	BARIUM	ppb	6	7	0		1000	EPA		Barium
A07	CADMIUM	ppb	2	7	7	***	10	EPA		Cadmium
A08	CHROMUM	ppb	10	7	7	***	50	EPA		Chromium
A10	SILVER	ppb	10	7	7	***	50	EPA		Silver
A20	ARSENIC	ppb	5	7	6		50	EPA		Arsenic
A21	MERCURY	ppb	0.1	7	7	***	2	EPA		Mercury
A22	SELENUM	ppb	5	7	7	***	10	EPA		Selenium
A51	LEADGF	ppb	5	7	7	***	50	EPA		Lead (graphite furnace)
C72	NITRATE	ppb	500	7	0		45000	EPA		Nitrate
C74	FLUORID	ppb	500	7	6		4000	EPA		Fluoride
H20	FBARIUM	ppb	6	7	0		1000	EPA		Barium, filtered
H21	FCADMIU	ppb	2	7	7	***	10	EPA		Cadmium, filtered
H22	FCHROMI	ppb	10	7	7	***	50	EPA		Chromium, filtered
H23	FSILVER	ppb	10	7	7	***	50	EPA		Silver, filtered
H37	FARSENI	ppb	5	7	5		50	EPA		Arsenic, filtered
H38	FMERCUR	ppb	0.1	7	7	***	2	EPA		Mercury, filtered
H39	FSELENI	ppb	5	7	7	***	10	EPA		Selenium, filtered
H41	FLEAD	ppb	5	7	7	***	50	EPA		Lead, filtered
H63	LFLUORD	ppb	20	7	0		4000	EPA		Fluoride, low DL

Constituent List=Water Quality Parameters

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standard	Water Standards Agency Exceeded		Full name
A11	SODIUM	ppb	200	7	0		.			Sodium
A17	MANGESE	ppb	5	7	6		50	EPAS	xxx	Manganese
A19	IRON	ppb	30	7	3		300	EPAS	xxx	Iron
C73	SULFATE	ppb	500	7	0		250000	EPAS		Sulfate
C75	CHLORID	ppb	500	7	0		250000	EPAS		Chloride
H24	FSODIUM	ppb	200	7	0		.			Sodium, filtered
H29	FMANGAN	ppb	5	7	5		50	EPAS		Manganese, filtered
H31	FIRON	ppb	30	7	7	***	300	EPAS		Iron, filtered
H67	LPHENOL	ppb	10	7	7	***	.			Phenol, low DL

TABLE 12. (contd)

Constituent List=Site Specific and Other Parameters

Constituent Code	Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standards Standard	Agency Exceeded	Full name
A01	BERYLUM	ppb	5	7	7	***	.		Beryllium
A03	STRONUM	ppb	20	7	0		.		Strontium
A04	ZINC	ppb	5	7	7	***	5000	EPAS	Zinc
A05	CALCIUM	ppb	50	7	0		.		Calcium
A12	NICKEL	ppb	10	7	7	***	.		Nickel
A13	COPPER	ppb	10	7	7	***	1300	EPAP	Copper
A14	VANADUM	ppb	5	7	1		.		Vanadium
A15	ANTIONY	ppb	100	7	7	***	.		Antimony
A16	ALUMNUM	ppb	150	7	7	***	.		Aluminum
A18	POTASUM	ppb	100	7	0		.		Potassium
A50	MAGNES	ppb	50	7	0		.		Magnesium
A61	TETRANE	ppb	5	7	7	***	5	EPA	Tetrachloromethane [Carbon Tetrachloride
A62	BENZENE	ppb	5	7	7	***	5	EPA	Benzene
A63	DIOXANE	ppb	500	7	7	***	.		Dioxane
A64	METHONE	ppb	10	7	7	***	.		Methyl ethyl ketone
A65	PYRIDIN	ppb	500	7	7	***	.		Pyridine
A66	TOLUENE	ppb	5	7	7	***	2000	EPAP	Toluene
A67	1,1,1-T	ppb	5	7	5		200	EPA	1,1,1-Trichloroethane
A68	1,1,2-T	ppb	5	7	7	***	.		1,1,2-Trichloroethane
A69	TRICENE	ppb	5	7	7	***	5	EPA	Trichloroethylene [1,1,2-Trichloroethene
A70	PERCENE	ppb	5	7	7	***	.		Perchloroethylene
A71	OPXYLE	ppb	5	7	7	***	440	EPAP	Xylene-o,p
A72	ACROLIN	ppb	10	7	7	***	.		Acrolein
A73	ACRYILE	ppb	10	7	7	***	.		Acrylonitrile
A74	BISTHER	ppb	10	7	7	***	.		Bis(chloromethyl) ether
A75	BROMONE	ppb	10	7	7	***	.		Bromoacetone
A76	METHBRO	ppb	10	7	7	***	.		Methyl bromide
A77	CARBIDE	ppb	10	7	7	***	.		Carbon disulfide
A78	CHLBENZ	ppb	10	7	7	***	60	EPAP	Chlorobenzene
A79	CHLTHER	ppb	10	7	7	***	.		2-Chloroethyl vinyl ether
A80	CHLFORM	ppb	5	7	7	***	100	EPA	Chloroform [Trichloromethane]
A81	METHCHL	ppb	10	7	7	***	.		Methyl chloride [Chloromethane]
A82	CHMTHER	ppb	10	7	7	***	.		Chloromethyl methyl ether
A83	CROTONA	ppb	10	7	7	***	.		Crotonaldehyde
A84	DIBRCHL	ppb	10	7	7	***	0	EPAP	1,2-Dibromo-3-chloropropane
A85	DIBRETH	ppb	10	7	7	***	.		1,2-Dibromoethane
A86	DIBRMET	ppb	10	7	7	***	.		Dibromomethane
A87	DIBUTEN	ppb	10	7	7	***	.		1,4-Dichloro-2-butene
A88	DICDIFM	ppb	10	7	7	***	.		Dichlorodifluoromethane
A89	1,1-DIC	ppb	10	7	7	***	.		1,1-Dichloroethane
A90	1,2-DIC	ppb	10	7	7	***	5	EPA	1,2-Dichloroethane
A91	TRANDCE	ppb	10	7	7	***	70	EPAP	trans-1,2-Dichloroethene
A92	DICETHY	ppb	10	7	7	***	7	EPA	1,1-Dichloroethylene
A93	METHYCH	ppb	10	7	7	***	.		Methylene chloride
A94	DICPANE	ppb	10	7	7	***	6	EPAP	1,2-Dichloropropane
A95	DICPENE	ppb	10	7	7	***	.		1,3-Dichloropropene
A96	NNDIEHY	ppb	10	7	7	***	.		N,N-diethylhydrazine
A99	HYDRSUL	ppb	10	7	7	***	.		Hydrogen sulfide
B01	IODOMET	ppb	10	7	7	***	.		Iodomethane
B02	METHACR	ppb	10	7	7	***	.		Methacrylonitrile
B03	METHTHI	ppb	10	7	7	***	.		Methanethiol
B04	PENTACH	ppb	10	7	7	***	.		Pentachloroethane

TABLE 12. (contd)

Constituent List=Site Specific and Other Parameters

Constituent Code	Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standard	Standards Agency Exceeded	Full name
B05	1112-tc	ppb	10	7	7	***	.		1,1,1,2-Tetrachlorethane
B06	1122-tc	ppb	10	7	7	***	.		1,1,2,2-Tetrachlorethane
B08	BROMORM	ppb	10	7	7	***	100	EPA	Bromoform [Tribromomethane]
B09	TRCMEOL	ppb	10	7	7	***	.		Trichloromethanethiol
B10	TRCMFLM	ppb	10	7	7	***	.		Trichloromonofluoromethane
B11	TRCPANE	ppb	10	7	7	***	.		Trichloropropane
B12	123-trp	ppb	10	7	7	***	.		1,2,3-Trichloropropane
B13	VINYIDE	ppb	10	7	7	***	2	EPA	Vinyl chloride
B14	M-XYLE	ppb	5	7	7	***	440	EPAP	Xylene-m
B15	DIETHY	ppb	10	7	7	***	.		Diethylarsine
B19	ACETILE	ppb	3000	7	7	***	.		Acetonitrile
C04	METACRY	ppb	10	7	7	***	.		Methyl methacrylate
C71	FORMALN	ppb	500	7	7	***	.		Formalin
C78	PHOSPHA	ppb	1000	7	7	***	.		Phosphate
H05	ETHOXID	ppb	3000	7	7	***	.		Ethylene oxide
H06	ETHMETH	ppb	10	7	7	***	.		Ethyl methacrylate
H16	TC	ppb	1000	7	0		.		Total carbon
H17	TDS	ppb	5000	7	0		500000	EPAS	Total dissolved solids
H18	FZINC	ppb	5	7	7	***	5000	EPAS	Zinc, filtered
H19	FCALCIU	ppb	50	7	0		.		Calcium, filtered
H25	FNICKEL	ppb	10	7	7	***	.		Nickel, filtered
H26	FCOPPER	ppb	10	7	7	***	1300	EPAP	Copper, filtered
H27	FVANADI	ppb	5	7	0		.		Vanadium, filtered
H28	FALUMIN	ppb	150	7	7	***	.		Aluminum, filtered
H30	FPOTASS	ppb	100	7	0		.		Potassium, filtered
H32	FMAGNES	ppb	50	7	0		.		Magnesium, filtered
H33	FBERYLL	ppb	5	7	7	***	.		Beryllium, filtered
H35	FSTRONT	ppb	20	7	0		.		Strontium, filtered
H36	FANTIMO	ppb	100	7	7	***	.		Antimony, filtered
H58	ALKALIN	ppb	20000	7	0		.		Total alkalinity, as CaCO3
H66	BROMIDE	ppb	1000	7	7	***	.		Bromide
H67	NITRITE	ppb	1000	7	7	***	.		Nitrite
H68	HEXONE	ppb	10	7	7	***	.		Hexone
J73	MIBK	ppb	0	1	0		.		4-Methyl-2-pentanone

*** - Indicates all samples were reported as below contractual detection limits
xxx - Indicates that Drinking Water Standards were exceeded
EPA - based on Maximum Contaminant Levels given in 40 CFR Part 141 (July,1987) National Primary Drinking Water Regulations as amended by 52 FR 25690
EPAR - based on National Interim Primary Drinking Water Regulations, Appendix IV, EPA-570/9-76-003
EPAP - based on proposed Maximum Contaminant Level Goals in 50 FR 46936
EPAS - based on Secondary Maximum Contaminant Levels given in 40 CFR Part 143 National Secondary Drinking Water Regulations
WDOE - based on additional Secondary Maximum Contaminant Levels given in WAC 248-54, Public Water Supplies

TABLE 13. Constituents with at Least One Detected Value for the Nonradioactive Dangerous Waste Landfill, July 1988

Well name	Collection Date	Duplicate sample number	CONDFLD umho 1/700w	CONDLAB umho ./700w	PH-LAB 0.01/8.5s	PHFIELD 0.1/8.5s	TOC ppb 1000/.	TOXLDL ppb 20/.
6-26-35A	29JUL88		207	409	7.7	7.2	362	-0.7
		1	207	412	7.7	7.3	377	1.7
		2	207	415	7.7	7.3	416	0.8
		3	207	410	7.7	7.3	588	11.8
6-26-35C	29JUL88		222	427	7.8	7.4	387	18.1
		1	221	426	7.8	7.4	295	-1.3
		2	222	422	7.8	7.4	272	6.1
		3	222	422	7.8	7.4	296	8.3
6-26-34	29JUL88		214	385	7.9	7.6	504	15.4
		1	214	387	7.8	7.6	446	-3.1
		2	214	388	7.8	7.6	1,000	2.5
		3	214	387	7.8	7.6	503	3.1
6-25-34B	10JUN88		337	.	.	7.8	.	23.5
		1	.	.	.	.	.	13.0
		2	.	.	.	.	.	4.2
		3	.	.	.	.	.	-0.5
	25JUL88		309	463	7.9	7.0	430	6.8
		1	308	462	7.9	7.1	403	9.7
		2	308	463	7.9	7.1	413	14.6
		3	309	461	7.9	7.1	424	16.7
6-25-34A	25JUL88		307	459	8.0	7.5	22,900	5.4
		1	306	461	7.9	7.5	507	4.4
		2	307	461	7.9	7.5	473	11.2
		3	307	459	7.9	7.5	667	8.9
6-25-33A	28JUL88		270	400	8.1	7.9	343	5.5
		1	271	399	8.0	7.9	512	6.6
		2	269	399	8.1	7.9	229	6.4
		3	270	399	8.0	7.9	216	7.2
6-26-33	28JUL88		279	399	8.0	7.8	625	7.7
		1	279	399	8.0	7.8	653	11.4
		2	280	399	8.0	7.8	380	4.8
		3	280	398	8.0	7.8	506	4.7

TABLE 13. (contd)

Well name	Collection Date	Duplicate sample number	1,1,1-T ppb 5/200	ALKALIN ppb 20000/.	ALPHA pCi/L 4/15	ARSENIC ppb 5/50	FARSENI ppb 5/50	BARIUM ppb 6/1000	FBARIUM ppb 6/1000	BETA pCi/L 8/50
6-26-35A	29JUL88		<5	115,000	1.60	<5	<5	31	36	30.30
6-26-35C	29JUL88		<5	122,000	1.61	<5	<5	49	47	22.50
6-26-34	29JUL88		<5	106,000	2.15	<5	<5	26	30	36.30
6-25-34B	25JUL88		3	119,000	1.76	<5	8	38	33	27.50
6-25-34A	25JUL88		3	115,000	2.30	5	<5	35	38	31.20
6-25-33A	28JUL88		<5	131,000	1.83	<5	<5	20	26	8.88
6-26-33	28JUL88		<5	111,000	1.35	<5	5	30	32	32.40

Well name	Collection Date	Duplicate sample number	FCALCIU ppb 50/.	CALCIUM ppb 50/.	CHLORID ppb 500/250000s	FLUORID ppb 500/4000	LFLUORD ppb 20/4000	IRON ppb 30/300s	MAGNES ppb 50/.	FMAGNES ppb 50/.
6-26-35A	29JUL88		40,700	39,400	6,500	<500	498	360	11,600	11,700
6-26-35C	29JUL88		44,100	44,800	8,420	<500	367	140	12,300	11,400
6-26-34	29JUL88		33,700	36,000	6,130	515	540	<30	10,700	9,910
6-25-34B	25JUL88		37,900	40,000	6,710	<500	533	<30	11,300	10,800
6-25-34A	25JUL88		41,200	35,100	6,640	<500	538	<30	10,100	11,700
6-25-33A	28JUL88		34,600	31,000	6,470	<500	384	96	8,860	9,550
6-26-33	28JUL88		34,400	34,900	6,380	<500	451	31	10,200	9,830

Well name	Collection Date	Duplicate sample number	FMANGAN ppb 5/50s	MANGESE ppb 5/50s	MIBK ppb 0/.	NITRATE ppb 500/45000	FPOTASS ppb 100/.	POTASUM ppb 100/.	SODIUM ppb 200/.	FSODIUM ppb 200/.
6-26-35A	29JUL88		<5	<5	.	33,800	6,700	6,180	24,100	24,800
6-26-35C	29JUL88		45	55	.	22,100	5,680	5,740	20,500	19,200
6-26-34	29JUL88		<5	<5	.	35,400	5,970	5,990	24,900	23,500
6-25-34B	25JUL88		<5	<5	.	34,000	6,090	6,220	23,300	22,600
6-25-34A	25JUL88		<5	<5	3	34,100	6,590	5,740	22,000	25,300
6-25-33A	28JUL88		7	<5	.	5,090	5,340	4,940	28,300	29,100
6-26-33	28JUL88		<5	<5	.	34,200	5,560	5,860	24,300	21,700

Well name	Collection Date	Duplicate sample number	FSTRONT ppb 20/.	STRONUM ppb 20/.	SULFATE ppb 500/250000s	TC ppb 1000/.	TDS ppb 5000/500000s	FVANADI ppb 5/.	VANADUM ppb 5/.
6-26-35A	29JUL88		193	192	43,000	27,400	263,000	24	21
6-26-35C	29JUL88		224	246	54,500	28,400	270,000	11	11
6-26-34	29JUL88		161	169	35,700	25,100	256,000	23	21
6-25-34B	25JUL88		174	180	38,800	27,200	264,000	23	23
6-25-34A	25JUL88		190	161	36,500	26,400	252,000	25	21
6-25-33A	28JUL88		208	193	43,800	30,000	235,000	7	<5
6-26-33	28JUL88		161	167	36,300	24,900	257,000	24	23

TABLE 13. (contd)

The column headers consist of : Constituent Name
Analysis Units
UST Detection Limit/Drinking Water Standard(suffix)

Suffix
none - based on Maximum Contaminant Levels given in 40 CFR Part 141 (July,1987) National Primary Drinking Water Regulations as amended by 52 FR 25690
r - based on National Interim Primary Drinking Water Regulations, Appendix IV, EPA-570/9-76-003
p - based on proposed Maximum Contaminant Level Goals in 50 FR 46936
s - based on Secondary Maximum Contaminant Levels given in 40 CFR Part 143 (July, 1987) National Secondary Drinking Water Regulations
w - based on additional Secondary Maximum Contaminant Levels given in WAC 248-54, Public Water Supplies

Data flags
* - For radioactive constituents, reported value is less than 2-sigma error

The July TOC data for well 699-25-34A have one high value out of four analyses, which will require resampling for verification.

The chemical data generally agree with previously reported data. Manganese and iron have reported values exceeding regulatory standards. Those standards are based on Secondary Maximum Contaminant Levels given in 40 CFR 143 and are related to the staining properties of these constituents. Coliform bacteria were not detected in any NRDW well this time. Of the volatile organic constituents, 1,1,1-trichloroethane was detected in wells 699-25-34A and 699-25-34B, and 4-methyl-2-pentanone was detected in well 699-25-34A this quarter. However, the concentrations are well below drinking water standards, and the only known source of these constituents is the Solid Waste Landfill.

The deep downgradient (east-side) well 699-25-33A continues to show a pattern of lower total beta activity and nitrate concentrations compared to all the other NRDW wells. Ground-water composition of the deep downgradient well also has lower calcium and higher sodium concentrations than that of the shallow wells completed in the top of the unconfined aquifer; the top of the unconfined aquifer at the NRDW is in Hanford formation, while the deep wells are completed in the Ringold Formation (Weekes, Luttrell, and Fuchs 1987).

1301-N LIQUID WASTE DISPOSAL FACILITY

T. J. Gilmore

Progress on the RCRA interim-status detection-level ground-water monitoring project at the 1301-N Liquid Waste Disposal Facility (LWDF) for the period from July 1 to September 30, 1988, is discussed below. The ground-water monitoring activities are based on RCRA requirements as described in 40 CFR 265.91. Previously issued reports have reported progress in the first and second quarters of 1988 (PNL 1988c,d).

DRILLING AND HYDROGEOLOGIC CHARACTERIZATION

The facility is located approximately 900 ft east of the Columbia River. It consists of a 52-by-12-ft concrete trough connected to a 125-by-250-ft rectangular basin. The basin bottom is covered with a 3-ft-thick layer of large stones. Adjacent to the basin is an excavated ditch 1600 ft long, 50 ft wide, and 12 ft deep, which extends to the north in a zigzag pattern and is intended to handle the overflow from the basin (Figure 14).

The 1301-N LWDF was used to dispose of waste streams that were generated in the N Reactor and 109-N Heat Exchanger Building. The facility was used from the startup of the N Reactor in 1963 until September 1985. The waste streams included reactor coolant system bleed off, spent fuel storage basin cooling water overflow, reactor periphery cooling systems bleed off, reactor primary coolant loop decontamination rinse solution, and building drain solution containing radioactive wastes generated from reactor support facilities.

Hydrogeologic Characterization

Water-level measurements are taken in most of the usable existing 100-N Area wells to characterize the ground-water system near the 1301-N LWDF. Monthly water-level measurements continued this quarter, with measurements taken in 43 wells in July, 44 wells in August, and 45 wells in September. Water table maps for each month are shown in Figures 15, 16, and 17.

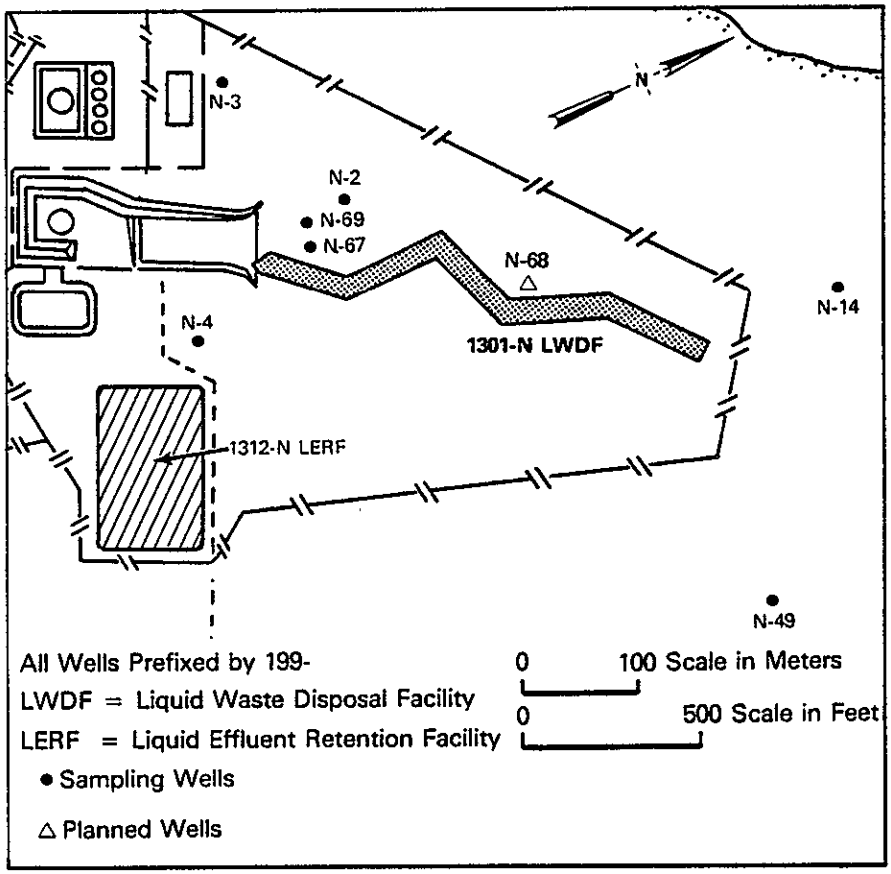

FIGURE 14. Monitoring Well Locations for the 1301-N Liquid Waste Disposal Facility

Initial Ground Water Sampling

Composite water samples were collected from two new wells, 199-N-67 and 199-N-69, during aquifer testing to determine the contaminants present in the ground-water before quarterly sampling. Water samples were taken at the beginning, middle, and end of the aquifer tests and combined to obtain a composite sample for each well. The results from these initial samplings are shown in Tables 14 and 15.

GROUND-WATER SAMPLING AND ANALYSIS

Seven ground-water wells are sampled for radiological and hazardous constituents in the vicinity of the 1301-N LWDF (Figure 11). Five of these wells (199-N-2, 199-N-3, 199-N-4, 199-N-14, and 199-N-49) have been sampled

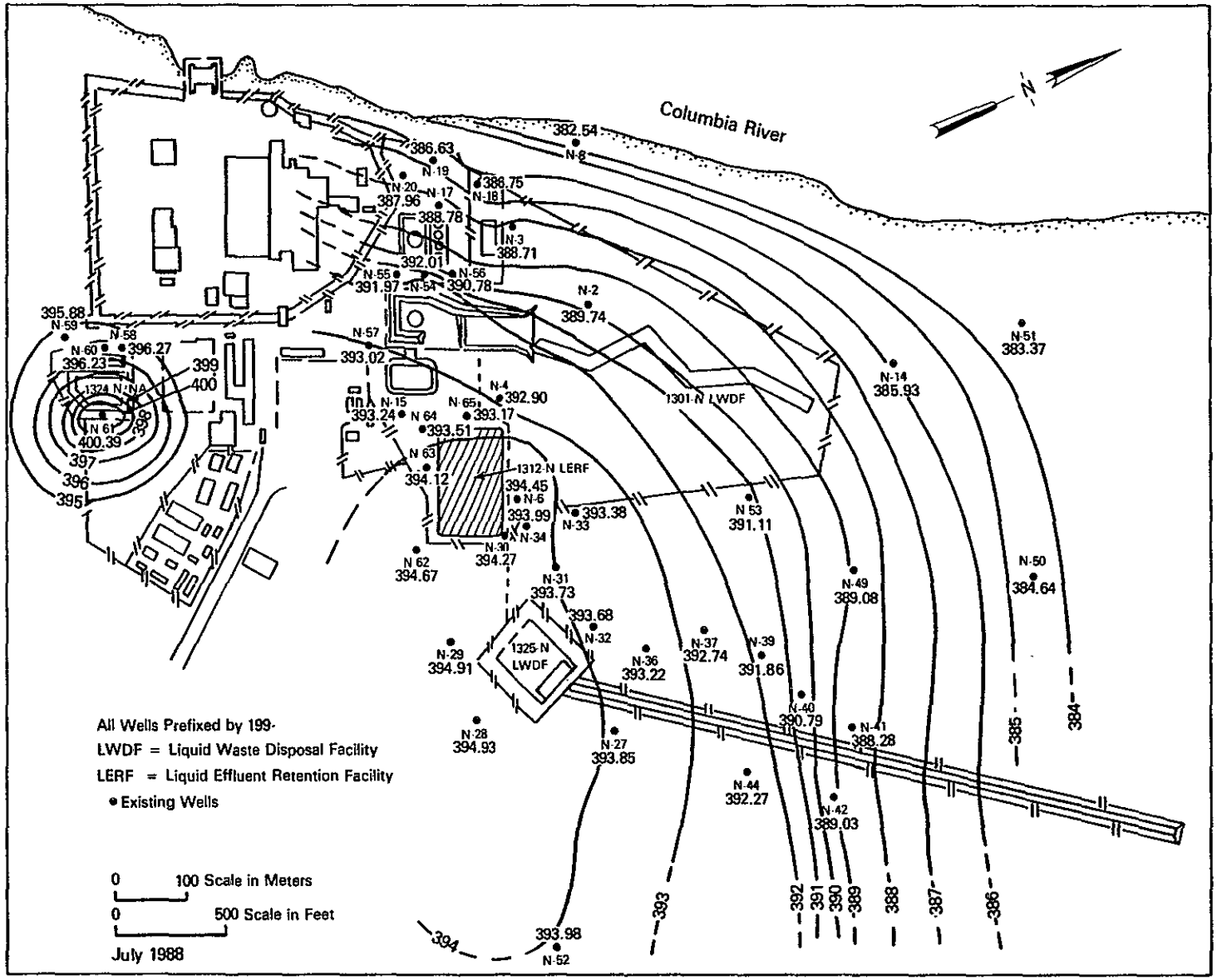

FIGURE 15. Water Table Map for the 100-N Area, July 1988

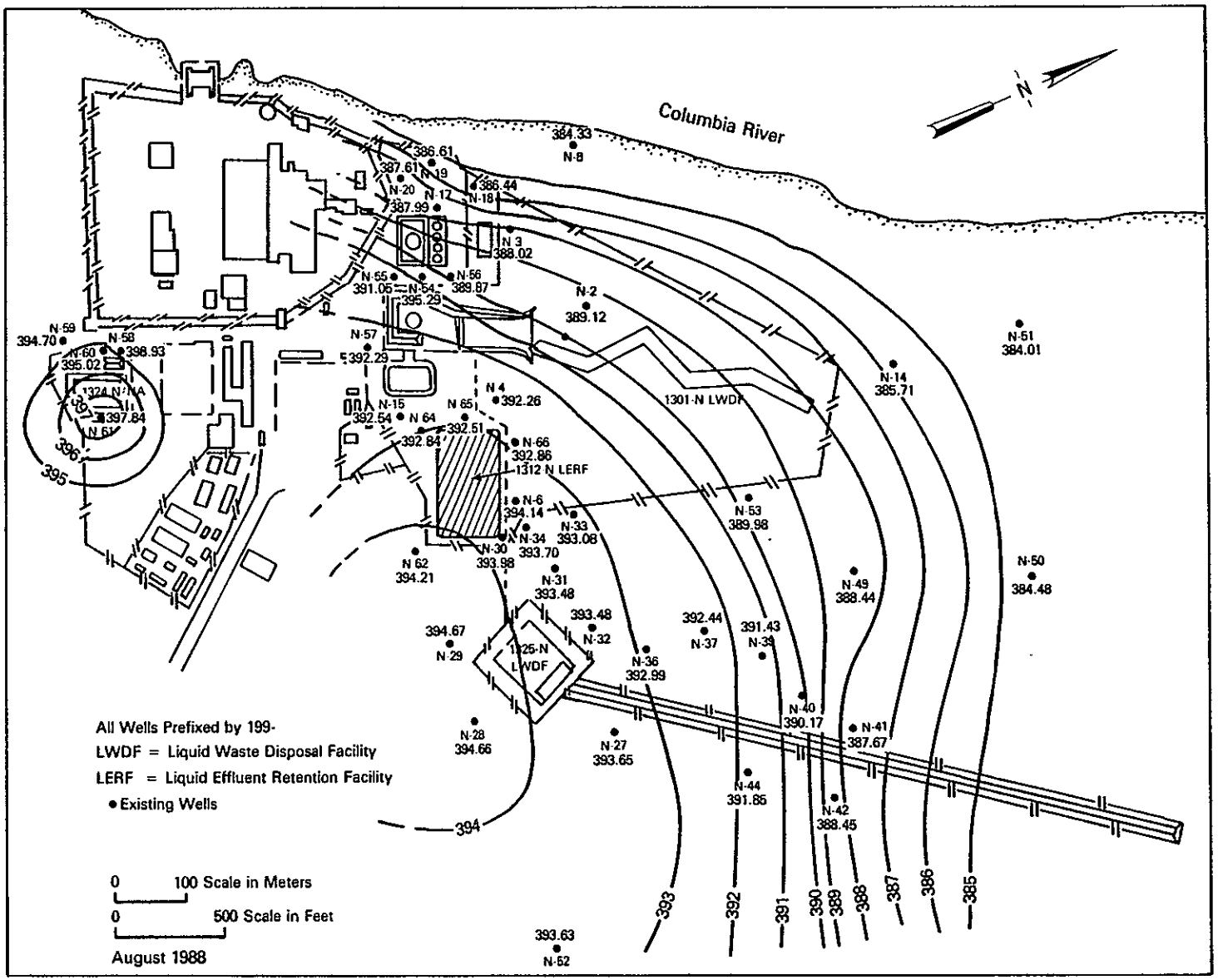

FIGURE 16. Water Table Map for the 100-N Area, August 1988

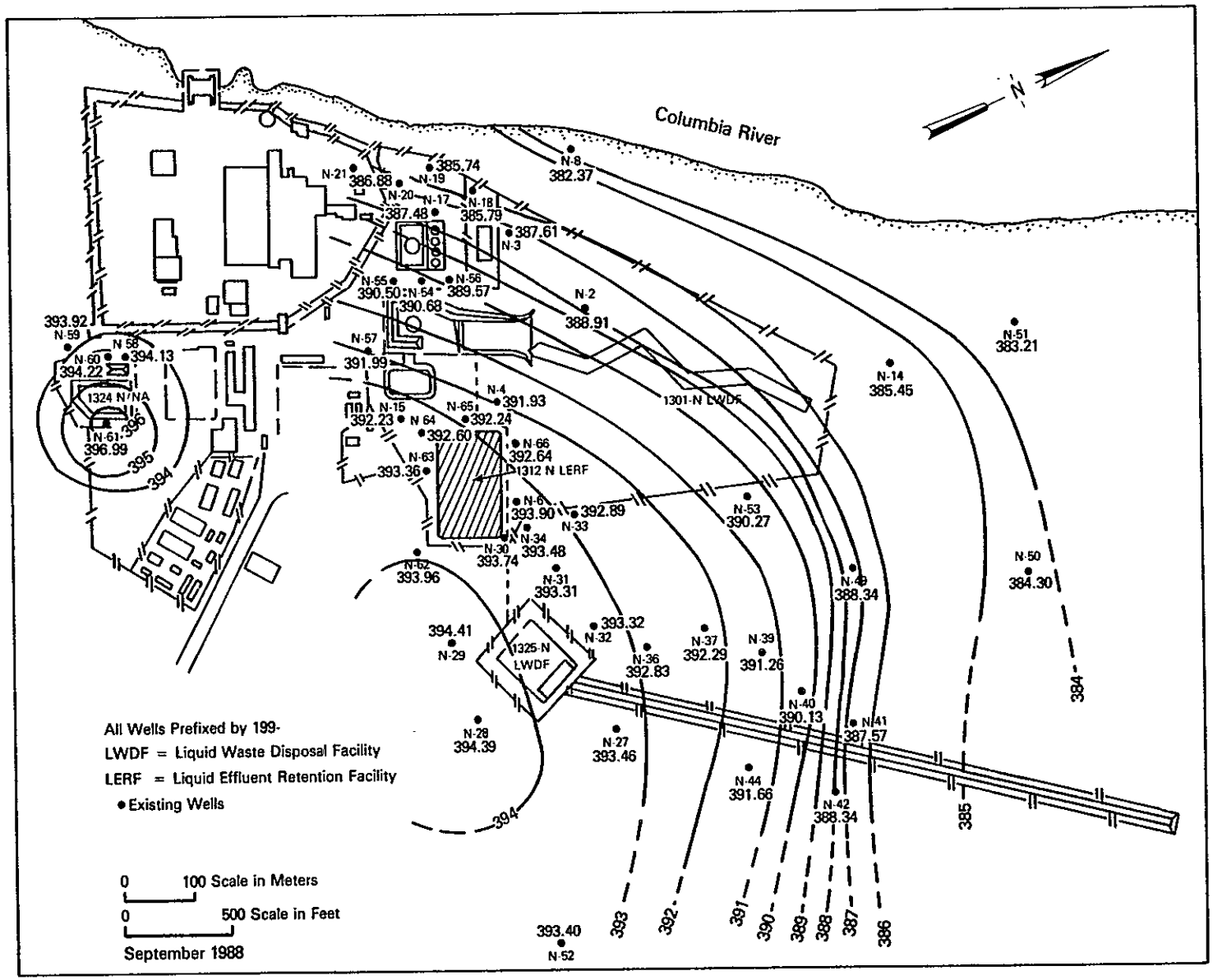

FIGURE 17. Water Table Map for the 100-N Area, September 1988

TABLE 14. Composite Ground-Water Analysis from Well 199-N-67, June 1988 (sample taken during aquifer testing)

Constituent (unit)	Result	Counting Error
Beta (pCi/L)	3.89E+04	1.70E+03
Lo Alpha (pCi/L)	3.97E-01(a)	6.26E-01
Plutonium-239,240 (pCi/L)	3.91E-03(a)	7.48E-03
Plutonium-238 (pCi/L)	1.44E-03(a)	1.30E-02
Tritium (pCi/L)	1.05E+05	1.23E+03
Strontium-90 (pCi/L)	3.38E+04	6.46E+02
Cobalt-60 (pCi/L)	1.04E+02	2.20E+01
Cesium-137 (pCi/L)	1.99E+00(a)	6.88E+00
Ruthenium-106 (pCi/L)	2.53E+01	6.31E+01

(a) Denotes less than overall counting error.

TABLE 15. Composite Ground-Water Analysis from Well 199-N-69, June 1988 (sample taken during aquifer testing)

Constituent (unit)	Result	Counting Error
Beta (pCi/L)	3.40E+01(a)	8.31E+01
Lo Alpha (pCi/L)	8.60E-01(a)	1.71E+01
Plutonium-239,240 (pCi/L)	2.69E-03(a)	1.08E-03
Plutonium-238 (pCi/L)	2.45E-02	2.41E-02
Tritium (pCi/L)	8.32E+04	1.07E+03
Strontium-90 (pCi/L)	9.07E-01(a)	9.25E-01
Cobalt-60 (pCi/L)	4.17E+01	1.09E+01
Cesium-137 (pCi/L)	1.06E+00(a)	3.63E+00
Ruthenium-106 (pCi/L)	4.09E+01	3.57E+01

(a) Denotes less than overall counting error.

TABLE 16. Sample Collection Schedule for the 1301-N Liquid Waste Disposal Facility

Well Number	1987			1988								
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
199-N-2			X			X			X			X
199-N-3			X			X			X			X
199-N-4			X			X			X			X
199-N-14			X			X			X			X
199-N-49			X			X			X			X
199-N-69												X

quarterly since December 1987. Two new wells were constructed in 1988 and were added to this network this quarter for sampling. The sampling schedule for the wells is listed in Table 16. An "X" under an individual month indicates that the well was sampled during that month. The analysis results from the sampling that was conducted June 27 and 29, 1988, on wells 199-N-2, 199-N-3, 199-N-4, 199-N-14, and 199-N-49 are presented in Tables 17, 18, and 19.

Each sample was analyzed include those for interim primary drinking water standards given in 40 CFR 265, water quality parameters, contamination indicators, and specific dangerous waste constituents known to have been discharged to the facility. The radionuclides tritium, strontium-90, natural uranium, cobalt-60, cesium-137, and ruthenium-106 were added to the list of analyses for the June 1988 sampling. Phenols, ammonia, and hydrazine were also added at this time. These radioactive and hazardous constituents may have been discharged to the facility in the past. In addition, selected samples were collected for analysis in June 1988 for those waste constituents defined as dangerous under WAC 173-303-9905 for which an adequate analytical method is available. An analytical method providing a lower detection limit for TOX was also used beginning in June 1988.

Discussion of Results

The beta concentrations in the five wells sampled in June (Table 16) exceed the EPA drinking water standard of 50 pCi/L. (Well 199-N-69 was sampled in September; well 199-N-67 could not be sampled because the

TABLE 17. Summary of Sampling Results for the 1301-N Liquid Waste Disposal Facility, June 1988

Constituent List=Contamination Indicator Parameters

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standard	Agency	Exceeded	Full name
191	CONDFLD	umho	1	20	0		700	WDOE		Specific conductance, field
199	PHFIELD		0.1	20	0		6.5-8.5	EPAS		pH, field
C68	TOX	ppb	100	20	0		.			Total organic halogen
C69	TOC	ppb	1000	20	0		.			Total organic carbon

Constituent List=Drinking Water Parameters

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standard	Agency	Exceeded	Full name
109	COLIFRM	MPN	2.2	5	5	***	1	EPA		Coliform bacteria
111	BETA	pCi/L	8	5	0		50	EPA	xxx	Gross beta
181	RADIUM	pCi/L	1	5	0		5	EPA		Total radium
212	ALPHA	pCi/L	4	5	0		15	EPA		Gross alpha
A06	BARIUM	ppb	6	5	0		1000	EPA		Barium
A07	CADMIUM	ppb	2	5	5	***	10	EPA		Cadmium
A08	CHROMUM	ppb	10	5	4		50	EPA		Chromium
A10	SILVER	ppb	10	5	5	***	50	EPA		Silver
A20	ARSENIC	ppb	5	5	5	***	50	EPA		Arsenic
A21	MERCURY	ppb	0.1	5	5	***	2	EPA		Mercury
A22	SELENUM	ppb	5	5	5	***	10	EPA		Selenium
A33	ENDRIN	ppb	0.1	5	5	***	0.2	EPA		Endrin
A34	METHLOR	ppb	3	5	5	***	100	EPA		Methoxychlor
A35	TOXAENE	ppb	1	5	5	***	5	EPA		Toxaphene
A36	a-BHC	ppb	0.1	5	5	***	4	EPA		Alpha-BHC
A37	b-BHC	ppb	0.1	5	5	***	4	EPA		Beta-BHC
A38	g-BHC	ppb	0.1	5	5	***	4	EPA		Gamma-BHC
A39	d-BHC	ppb	0.1	5	5	***	4	EPA		Delta-BHC
A51	LEADGF	ppb	5	5	5	***	50	EPA		Lead (graphite furnace)
C72	NITRATE	ppb	500	5	0		45000	EPA		Nitrate
C74	FLUORID	ppb	500	5	5	***	4000	EPA		Fluoride
H13	2,4-D	ppb	2	5	5	***	100	EPA		2,4-D [2,4-Dichlorophenoxyacetic acid]
H14	2,4,5TP	ppb	2	5	5	***	10	EPA		2,4,5-TP silvex
H20	FBARIUM	ppb	6	5	0		1000	EPA		Barium, filtered
H21	FCADMIU	ppb	2	5	5	***	10	EPA		Cadmium, filtered
H22	FCHROMI	ppb	10	5	5	***	50	EPA		Chromium, filtered
H23	FSILVER	ppb	10	5	5	***	50	EPA		Silver, filtered
H37	FARSENI	ppb	5	5	4		50	EPA		Arsenic, filtered
H38	FMERCUR	ppb	0.1	5	5	***	2	EPA		Mercury, filtered
H39	FSELENI	ppb	5	5	5	***	10	EPA		Selenium, filtered
H41	FLEAD	ppb	5	5	5	***	50	EPA		Lead, filtered

TABLE 17. (contd)

Constituent List=Water Quality Parameters

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standard	Standards Agency	Exceeded	Full name
A11	SODIUM	ppb	200	5	0		.			Sodium
A17	MANGESE	ppb	5	5	3		50	EPAS	xxx	Manganese
A19	IRON	ppb	30	5	0		300	EPAS	xxx	Iron
C73	SULFATE	ppb	500	5	0		250000	EPAS		Sulfate
C75	CHLORID	ppb	500	5	0		250000	EPAS		Chloride
H24	FSODIUM	ppb	200	5	0		.			Sodium, filtered
H29	FMANGAN	ppb	5	5	3		50	EPAS		Manganese, filtered
H31	FIRON	ppb	30	5	4		300	EPAS		Iron, filtered
H57	LPHENOL	ppb	10	5	5	***	.			Phenol, low DL

Constituent List=Site Specific and Other Parameters

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standard	Standards Agency	Exceeded	Full name
010	CO-60	pCi/L	22.5	5	0		100	EPAR	xxx	Cobalt-60
024	CS-137	pCi/L	20	5	0		200	EPAR		Cesium-137
034	RU-106	pCi/L	172.5	5	0		30	EPAR		Ruthenium-106
108	TRITIUM	pCi/L	500	5	0		20000	EPA	xxx	Tritium (H-3)
121	SR-90	pCi/L	5	5	0		8	EPA	xxx	Strontium-90
124	U-CHEM	ug/L	0.725	5	0		.			Uranium, chemical
A04	ZINC	ppb	5	5	0		5000	EPAS		Zinc
A06	CALCIUM	ppb	50	5	0		.			Calcium
A12	NICKEL	ppb	10	5	4		.			Nickel
A13	COPPER	ppb	10	5	4		1300	EPAP		Copper
A14	VANADUM	ppb	5	5	1		.			Vanadium
A16	ALUMNUM	ppb	150	5	3		.			Aluminum
A18	POTASUM	ppb	100	5	0		.			Potassium
A50	MAGNES	ppb	50	5	0		.			Magnesium
A54	AR1016	ppb	1	5	5	***	0	EPAP		Arochlor 1016
A55	AR1221	ppb	1	5	5	***	0	EPAP		Arochlor 1221
A56	AR1232	ppb	1	5	5	***	0	EPAP		Arochlor 1232
A57	AR1242	ppb	1	5	5	***	0	EPAP		Arochlor 1242
A58	AR1248	ppb	1	5	5	***	0	EPAP		Arochlor 1248
A59	AR1254	ppb	1	5	5	***	0	EPAP		Arochlor 1254
A60	AR1260	ppb	1	5	5	***	0	EPAP		Arochlor 1260
A61	TETRANE	ppb	5	4	4	***	5	EPA		Tetrachloromethane [Carbon Tetrachloride
A64	METHONE	ppb	10	4	4	***	.			Methyl ethyl ketone
A67	1,1,1-T	ppb	5	4	4	***	200	EPA		1,1,1-Trichloroethane
A68	1,1,2-T	ppb	5	4	4	***	.			1,1,2-Trichloroethane
A69	TRICENE	ppb	5	4	4	***	5	EPA		Trichloroethylene [1,1,2-Trichloroethene
A70	PERCENE	ppb	5	4	4	***	.			Perchloroethylene
A71	OPXYLE	ppb	5	4	4	***	440	EPAP		Xylene-o,p
A80	CHLFORM	ppb	5	4	3		100	EPA		Chloroform [Trichloromethane]
A93	METHYCH	ppb	10	4	3		.			Methylene chloride
B14	M-XYLE	ppb	5	4	4	***	440	EPAP		Xylene-m
C76	PHOSPHA	ppb	1000	5	5	***	.			Phosphate
C80	AMMONIU	ppb	50	5	5	***	.			Ammonium ion
H18	FZINC	ppb	5	5	1		5000	EPAS		Zinc, filtered
H19	FCALCIU	ppb	50	5	0		.			Calcium, filtered
H25	FNICKEL	ppb	10	5	5	***	.			Nickel, filtered
H26	FCOPPER	ppb	10	5	5	***	1300	EPAP		Copper, filtered
H27	FVANADI	ppb	5	5	1		.			Vanadium, filtered
H28	FALUMIN	ppb	150	5	5	***	.			Aluminum, filtered
H30	FPOTASS	ppb	100	5	0		.			Potassium, filtered
H32	FMAGNES	ppb	50	5	0		.			Magnesium, filtered
H62	LHYDRAZ	ppb	30	5	5	***	.			Hydrazine, low DL
H68	HEXONE	ppb	10	4	4	***	.			Hexone

TABLE 17. (contd)

*** - Indicates all samples were reported as below contractual detection limits
xxx - Indicates that Drinking Water Standards were exceeded
EPA - based on Maximum Contaminant Levels given in 40 CFR Part 141 (July,1987) National Primary Drinking Water Regulations as amended by 52 FR 25690
EPAR - based on National Interim Primary Drinking Water Regulations, Appendix IV, EPA-570/9-76-003
EPAP - based on proposed Maximum Contaminant Level Goals in 50 FR 46936
EPAS - based on Secondary Maximum Contaminant Levels given in 40 CFR Part 143 National Secondary Drinking Water Regulations
WDOE - based on additional Secondary Maximum Contaminant Levels given in WAC 248-54, Public Water Supplies

TABLE 18. Constituents with at Least One Detected Value for the 1301-N Liquid Waste Disposal Facility, June 1988

Well name	Collection Date	Duplicate sample number	ALPHA pCi/L 4/15	ALUMNUM ppb 150/.	FARSENI ppb 5/50	BARIUM ppb 6/1000	FBARIUM ppb 6/1000	BETA pCi/L 8/50	FCALCIU ppb 50/.	CALCIUM ppb 50/.	CHLFORM ppb 5/100	CHLORID ppb 500/250000s
1-N-2	27JUN88		*0.342	<150	<5	21	22	5,620.0	27,800	31,500	3	1,080
1-N-3	29JUN88		*0.744	189	<5	116	106	3,280.0	103,000	113,000	.	7,040
1-N-4	27JUN88		*0.185	880	<5	38	21	102.0	29,400	31,100	<5	1,600
1-N-14	29JUN88		*-0.029	<150	<5	15	17	2,330.0	25,300	26,100	<5	886
1-N-49	29JUN88		*0.545	<150	5	17	22	99.5	30,900	27,500	<5	885

Well name	Collection Date	Duplicate sample number	CHROMUM ppb 10/50	CO-60 pCi/L 22.5/100r	COPPER ppb 10/1300p	CS-137 pCi/L 20/200r	IRON ppb 30/300s	FIRON ppb 30/300s	MAGNES ppb 50/.	FMAGNES ppb 50/.	FMANGAN ppb 5/50s	MANGESE ppb 5/50s
1-N-2	27JUN88		<10	59.1	<10	*-1.410	96	<30	5,090	4,870	<5	<5
1-N-3	29JUN88		<10	28.6	<10	*-0.373	1,260	51	17,400	16,700	19	63
1-N-4	27JUN88		39	62.0	22	*-2.980	4,620	<30	5,360	5,110	12	103
1-N-14	29JUN88		<10	90.2	<10	*1.770	55	<30	4,360	4,110	<5	<5
1-N-49	29JUN88		<10	124.0	<10	*0.373	65	<30	5,680	6,280	<5	<5

Well name	Collection Date	Duplicate sample number	METHYCH ppb 10/.	NICKEL ppb 10/.	NITRATE ppb 500/45000	FPOTASS ppb 100/.	POTASUM ppb 100/.	RADIUM pCi/L 1/5	RU-106 pCi/L 172.5/30r	SODIUM ppb 200/.	FSODIUM ppb 200/.	SR-90 pCi/L 5/8
1-N-2	27JUN88		<10	<10	33,000	1,730	1,820	*0.0782	95.9	3,100	3,030	2,360.0
1-N-3	29JUN88		.	<10	25,100	3,510	3,620	*0.0620	0.0	15,700	15,700	2,430.0
1-N-4	27JUN88		<10	112	26,800	2,920	3,050	*-0.0549	*22.5	4,220	4,650	13.2
1-N-14	29JUN88		4	<10	34,900	1,580	1,610	*-0.0612	*-38.9	3,360	3,120	957.0
1-N-49	29JUN88		<10	<10	44,800	3,180	3,070	*0.0640	*37.8	4,220	4,460	10.2

Well name	Collection Date	Duplicate sample number	SULFATE ppb 500/250000s	TRITIUM pCi/L 500/20000	U-CHEM ug/L 0.725/.	FVANADI ppb 5/.	VANADUM ppb 5/.	ZINC ppb 5/5000s	FZINC ppb 5/5000s
1-N-2	27JUN88		10,400	89,000	0.276	7	7	9	6
1-N-3	29JUN88		223,000	43,200	1.900	<5	<5	5	<5
1-N-4	27JUN88		14,900	85,000	0.483	9	16	155	9
1-N-14	29JUN88		44,800	112,000	0.219	6	6	7	11
1-N-49	29JUN88		8,270	113,000	0.369	16	10	6	10

TABLE 19. Quadruplicate Samples of Indicator Parameters for the 1301-N Liquid Waste Disposal Facility, June 1988

Well name	Collection Date	Duplicate sample number	CONDFLD umho 1/700w	PHFIELD 0.1/8.5s	TOC ppb 1000/.	TOX ppb 100/.
1-N-2	27JUN88		195	7.1	309	-2.3
		1	195	7.3	304	10.7
		2	193	7.3	266	9.2
		3	193	7.4	284	3.8
1-N-3	29JUN88		495	7.1	810	1,670
		1	494	7.2	17,100	1,380
		2	495	7.2	596	1,020
		3	494	7.2	651	1,490
1-N-4	27JUN88		208	7.9	343	2.0
		1	206	7.8	445	3.5
		2	206	7.8	384	7.7
		3	206	7.8	384	13.9
1-N-14	29JUN88		155	7.9	286	6.1
		1	155	7.9	114	13.7
		2	157	7.9	73	-7.1
		3	155	7.9	140	3.2
1-N-49	29JUN88		174	7.8	70	6.4
		1	174	7.8	58	3.1
		2	174	7.8	386	2.2
		3	174	7.8	362	4.8

HydroStar pump needed to be replaced. The pump was replaced in mid-October, and the well will be sampled next quarter.) Of the site-specific constituents analyzed for, the concentrations of cobalt-60 in well 199-N-49 exceed the drinking water standard. The concentrations of tritium and strontium-90 exceed the drinking water standards in all five wells sampled.

The nitrate concentrations have declined from the previous quarter, and all five wells sampled were below the drinking water standard of 45,000 ppb. High TOX values were reported in well 199-N-3. These are the first TOX data measured in this well, and additional samples must be collected to verify these results. The sample was also analyzed for a limited set of volatile organic constituents, although the results showed nothing that would explain these high TOX values. If high TOX values are also obtained in the next quarterly sampling, a more thorough analyses will be conducted to determine the constituents that may be contributing to these high values.

One of the four quadruplicate TOC values in well 199-N-3 was extremely high; the quadruplicate laboratory measurements of this particular indicator ranged from 596 to 17,100 ppb (Table 19). The measurement could possibly be attributed to external contamination of this particular sample because none of the other results were unusual.

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1324-N/NA SURFACE IMPOUNDMENT AND PERCOLATION PONDS

T. J. Gilmore

Progress on the RCRA interim-status detection-level ground-water monitoring project at the 1324-N/NA Surface Impoundment and Percolation Ponds for the period from July 1 to September 30, 1988, is discussed below. The ground-water monitoring activities at this site are based on RCRA requirements as described in 40 CFR 265.91. Previously issued reports have reported progress in the first and second quarters of 1988 (PNL 1988c,d).

The 1324-NA percolation pond is an unlined pond that was used to treat corrosive hazardous wastes from August 1977 to May 1983. In May 1983, the 1324-N surface impoundment was put into service to treat the corrosive wastes. This facility is a double-lined pond with a leachate collection system used to neutralize the wastes before discharge into the 1324-NA percolation pond (Figure 18).

The effluent streams are waste products resulting from the regeneration of anion and cation exchange columns. The exchange columns are used to demineralize water for use in the N Reactor cooling system. The waste streams range in pH from 1.0 to 14.0 depending on the type of regeneration taking place. When the pH of this waste is less than or equal to 2.0 or greater than or equal to 12.5, the waste is defined as corrosive [40 CFR 261.22(a)(2) and WAC 173-303-090(6)(a)(i)].

DRILLING AND HYDROGEOLOGIC CHARACTERIZATION

No new wells were drilled this quarter. Hydrogeologic characterization activities are reported in the next sections.

Hydrogeologic Characterization

Water-level measurements are taken in most of the usable existing 100-N Area wells to characterize the ground-water system near the 1324 N/NA facilities. Monthly water-level measurements continued this quarter, with measurements taken in 43 wells in July, 44 wells in August, and 45 wells in September. Water table maps for each month are shown in Figures 15, 16, and 17.

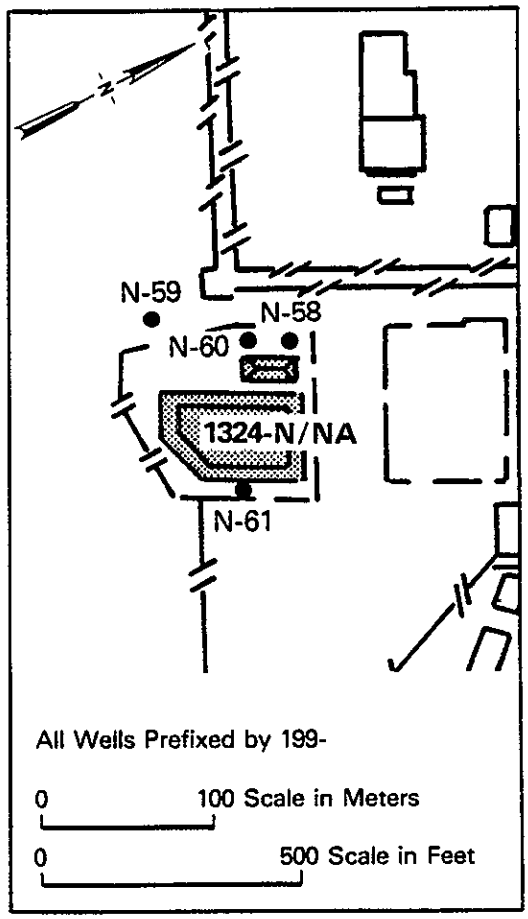

FIGURE 18. Monitoring Well Locations for the 1324-N/NA Surface Impoundment and Percolation Ponds

GROUND-WATER SAMPLING AND ANALYSIS

Four ground-water wells are currently sampled for radiological and hazardous constituents. The ground water around the 1324-N/NA ponds was sampled and analyzed monthly for the first quarter starting in December 1987 and sampled quarterly thereafter. The four wells used in the monitoring network were drilled in 1987. No new wells have been drilled at the site. Table 20 shows the sample collection schedule for 1988. An "X" under an individual month indicates that the sample was collected during that month.

Each sample was analyzed for the interim primary drinking water standards given in 40 CFR 265, water quality parameters, contamination indicators, and specific dangerous waste constituents known to have been discharged to the facility. The radionuclides tritium, strontium-90, natural uranium, cobalt-60, cesium-137, and ruthenium-106 were added to the list of analyses for the June 1988 sampling. Phenols, ammonia, and hydrazine were also added at this time. These radioactive and hazardous constituents have not been discharged to the 1324-N/NA facilities, but may have been discharged to other facilities in the vicinity. In addition, selected samples were collected for analysis in June 1988 for those waste constituents defined as dangerous under WAC 173-303-9905 for which an adequate analytical method is available.

Discussion of Results

All analyses from this reporting period are summarized in Tables 21, 22, and 23. The drinking water standards for sulfate and iron have been exceeded in wells monitoring the 1324-N/NA facilities. Sulfate standards were exceeded for all four wells sampled, and iron was exceed in well 199-N-61.

TABLE 20. Sample Collection Schedule for the 1324 N/NA Facilities

	1987			1988								
Well Number	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
199-N-58			X	X	X	X			X			X
199-N-59			X	X	X	X			X			X
199-N-60			X	X	X	X			X			X
199-N-61			X	X	X	X			X			X

TABLE 21. Summary of Sampling Results for the 1324-N/NA Facilities, July 1988

Constituent List=Contamination Indicator Parameters

Constituent Code	Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standard	Standards Agency	Exceeded	Full name
088	CONDLAB	umho	.	16	0		700	WDOE	xxx	Specific conductance, laboratory
191	CONDFLD	umho	1	16	0		700	WDOE	xxx	Specific conductance, field
199	PHFIELD		0.1	16	0		6.5-8.5	EPAS	xxx	pH, field
207	PH-LAB		0.01	16	0		6.5-8.5	EPAS		pH, laboratory
C68	TOX	ppb	100	16	0		.			Total organic halogen
C69	TOC	ppb	1000	16	0		.			Total organic carbon

Constituent List=Drinking Water Parameters

Constituent Code	Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standard	Standards Agency	Exceeded	Full name
109	COLIFRM	MPN	2.2	4	4	***	1	EPA		Coliform bacteria
111	BETA	pCi/L	8	5	0		50	EPA		Gross beta
181	RADIUM	pCi/L	1	4	0		5	EPA		Total radium
212	ALPHA	pCi/L	4	5	0		15	EPA		Gross alpha
A06	BARIUM	ppb	6	4	0		1000	EPA		Barium
A07	CADMIUM	ppb	2	4	4	***	10	EPA		Cadmium
A08	CHROMUM	ppb	10	4	4	***	50	EPA		Chromium
A10	SILVER	ppb	10	4	4	***	50	EPA		Silver
A20	ARSENIC	ppb	5	4	4	***	50	EPA		Arsenic
A21	MERCURY	ppb	0.1	4	4	***	2	EPA		Mercury
A22	SELENUM	ppb	5	4	3		10	EPA		Selenium
A33	ENDRIN	ppb	0.1	4	4	***	0.2	EPA		Endrin
A34	METHLOR	ppb	3	4	4	***	100	EPA		Methoxychlor
A35	TOXAENE	ppb	1	4	4	***	5	EPA		Toxaphene
A36	a-BHC	ppb	0.1	4	4	***	4	EPA		Alpha-BHC
A37	b-BHC	ppb	0.1	4	4	***	4	EPA		Beta-BHC
A38	g-BHC	ppb	0.1	4	4	***	4	EPA		Gamma-BHC
A39	d-BHC	ppb	0.1	4	4	***	4	EPA		Delta-BHC
A51	LEADGF	ppb	5	4	4	***	50	EPA		Lead (graphite furnace)
C72	NITRATE	ppb	500	5	0		45000	EPA		Nitrate
C74	FLUORID	ppb	500	5	0		4000	EPA		Fluoride
H13	2,4-D	ppb	2	4	4	***	100	EPA		2,4-D [2,4-Dichlorophenoxyacetic acid]
H14	2,4,5TP	ppb	2	4	4	***	10	EPA		2,4,5-TP silvex
H20	FBARIUM	ppb	6	5	0		1000	EPA		Barium, filtered
H21	FCADMIU	ppb	2	5	5	***	10	EPA		Cadmium, filtered
H22	FCHROMI	ppb	10	5	5	***	50	EPA		Chromium, filtered
H23	FSILVER	ppb	10	5	5	***	50	EPA		Silver, filtered
H37	FARSENI	ppb	5	5	5	***	50	EPA		Arsenic, filtered
H38	FMERCUR	ppb	0.1	4	4	***	2	EPA		Mercury, filtered
H39	FSELENI	ppb	5	5	5	***	10	EPA		Selenium, filtered
H41	FLEAD	ppb	5	5	5	***	50	EPA		Lead, filtered

TABLE 21. (contd)

Constituent List=Water Quality Parameters

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standard	Standards Agency Exceeded		Full name
A11	SODIUM	ppb	200	4	0		.			Sodium
A17	MANGESE	ppb	5	4	2		50	EPAS		Manganese
A19	IRON	ppb	30	4	0		300	EPAS	xxx	Iron
C57	PHENOL	ppb	10	4	4	***	.			Phenol
C73	SULFATE	ppb	500	5	0		250000	EPAS	xxx	Sulfate
C75	CHLORID	ppb	500	5	0		250000	EPAS		Chloride
H24	FSODIUM	ppb	200	5	0		.			Sodium, filtered
H29	FMANGAN	ppb	5	5	3		50	EPAS		Manganese, filtered
H31	FIRON	ppb	30	5	5	***	300	EPAS		Iron, filtered

Constituent List=Site Specific and Other Parameters

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standard	Standards Agency Exceeded		Full name
010	CO-60	pCi/L	22.5	4	0		100	EPAR		Cobalt-60
024	CS-137	pCi/L	20	4	0		200	EPAR		Cesium-137
034	RU-106	pCi/L	172.6	4	0		30	EPAR		Ruthenium-106
124	U-CHEM	ug/L	0.725	5	0		.			Uranium, chemical
108	TRITIUM	pCi/L	500	4	0		20000	EPA		Tritium (H-3)
121	SR-90	pCi/L	5	4	0		8	EPA		Strontium-90
A01	BERYLUM	ppb	5	4	4	***	.			Beryllium
A03	STRONUM	ppb	20	4	0		.			Strontium
A04	ZINC	ppb	5	4	0		5000	EPAS		Zinc
A05	CALCIUM	ppb	50	4	0		.			Calcium
A12	NICKEL	ppb	10	4	4	***	.			Nickel
A13	COPPER	ppb	10	4	3		1300	EPAP		Copper
A14	VANADUM	ppb	5	4	1		.			Vanadium
A15	ANTIONY	ppb	100	4	4	***	.			Antimony
A16	ALUMNUM	ppb	150	4	3		.			Aluminum
A18	POTASUM	ppb	100	4	0		.			Potassium
A50	MAGNES	ppb	50	4	0		.			Magnesium
A64	METHONE	ppb	10	5	5	***	.			Methyl ethyl ketone
A68	1,1,2-T	ppb	5	5	5	***	.			1,1,2-Trichloroethane
A70	PERCENE	ppb	5	5	5	***	.			Perchloroethylene
A71	OPXYLE	ppb	5	5	5	***	440	EPAP		Xylene-o,p
A80	CHLFORM	ppb	5	5	0		100	EPA		Chloroform [Trichloromethane]
A93	METHYCH	ppb	10	5	2		.			Methylene chloride
B14	M-XYLE	ppb	5	5	5	***	440	EPAP		Xylene-m
C76	PHOSPHA	ppb	1000	5	5	***	.			Phosphate
C80	AMMONIU	ppb	50	5	5	***	.			Ammonium ion
H16	TC	ppb	1000	4	0		.			Total carbon
H18	FZINC	ppb	5	5	5	***	5000	EPAS		Zinc, filtered
H19	FCALCIU	ppb	50	5	0		.			Calcium, filtered
H25	FNICKEL	ppb	10	5	5	***	.			Nickel, filtered
H26	FCOPPER	ppb	10	5	5	***	1300	EPAP		Copper, filtered
H27	FVANADI	ppb	5	5	4		.			Vanadium, filtered
H28	FALUMIN	ppb	150	5	5	***	.			Aluminum, filtered
H30	FPOTASS	ppb	100	5	0		.			Potassium, filtered
H32	FMAGNES	ppb	50	5	0		.			Magnesium, filtered
H33	FBERYLL	ppb	5	5	5	***	.			Beryllium, filtered
H35	FSTRONT	ppb	20	5	0		.			Strontium, filtered
H36	FANTIMO	ppb	100	5	5	***	.			Antimony, filtered
H58	ALKALIN	ppb	20000	4	0		.			Total alkalinity, as CaCO3
H68	HEXONE	ppb	10	5	5	***	.			Hexone

TABLE 21. (contd)

Constituent List=WAC 173-303-9905

Constituent Code	Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standards Standard	Agency Exceeded	Full name
A23	THALIUM	ppb	5	4	4	***	.		Thallium
A24	THIOURA	ppb	200	4	4	***	.		Thiourea
A25	ACETREA	ppb	200	4	4	***	.		1-Acetyl-2-thiourea
A26	CHLOREA	ppb	200	4	4	***	.		1-(o-Chlorophenyl) thiourea
A27	DIETROL	ppb	200	4	4	***	.		Diethylstilbesterol
A28	ETHYREA	ppb	200	4	4	***	.		Ethylenethiourea
A29	NAPHREA	ppb	200	4	4	***	.		1-Naphthyl-2-thiourea
A32	PHENREA	ppb	500	4	4	***	.		N-phenylthiourea
A40	DDD	ppb	0.1	4	4	***	.		DDD
A41	DDE	ppb	0.1	4	4	***	.		DDE
A42	DDT	ppb	0.1	4	4	***	.		DDT
A43	HEPTLOR	ppb	0.1	4	4	***	0	EPAP	Heptachlor
A44	HEPTIDE	ppb	0.1	4	4	***	0	EPAP	Heptachlor epoxide
A46	DIELRIN	ppb	0.1	4	4	***	.		Dieldrin
A47	ALDRIN	ppb	0.1	4	4	***	.		Aldrin
A48	CHLOANE	ppb	1	4	4	***	0	EPAP	Chlordane
A49	ENDO1	ppb	0.1	4	4	***	.		Endosulfan I (alpha)
A52	ENDO2	ppb	0.1	4	4	***	.		Endosulfan II (beta)
A54	AR1016	ppb	1	4	4	***	0	EPAP	Arochlor 1016
A55	AR1221	ppb	1	4	4	***	0	EPAP	Arochlor 1221
A56	AR1232	ppb	1	4	4	***	0	EPAP	Arochlor 1232
A57	AR1242	ppb	1	4	4	***	0	EPAP	Arochlor 1242
A58	AR1248	ppb	1	4	4	***	0	EPAP	Arochlor 1248
A59	AR1254	ppb	1	4	4	***	0	EPAP	Arochlor 1254
A60	AR1260	ppb	1	4	4	***	0	EPAP	Arochlor 1260
A61	TETRANE	ppb	5	5	5	***	5	EPA	Tetrachloromethane [Carbon Tetrachloride
A62	BENZENE	ppb	5	5	5	***	5	EPA	Benzene
A63	DIOXANE	ppb	500	5	5	***	.		Dioxane
A65	PYRIDIN	ppb	500	5	5	***	.		Pyridine
A66	TOLUENE	ppb	5	5	5	***	2000	EPAP	Toluene
A67	1,1,1-T	ppb	5	5	5	***	200	EPA	1,1,1-Trichloroethane
A69	TRICENE	ppb	5	5	5	***	5	EPA	Trichloroethylene [1,1,2-Trichloroethene
A72	ACROLIN	ppb	10	5	5	***	.		Acrolein
A73	ACRYILE	ppb	10	5	5	***	.		Acrylonitrile
A74	BISTHER	ppb	10	5	5	***	.		Bis(chloromethyl) ether
A75	BROMONE	ppb	10	5	5	***	.		Bromoacetone
A76	METHBRO	ppb	10	5	5	***	.		Methyl bromide
A77	CARBIDE	ppb	10	5	5	***	.		Carbon disulfide
A78	CHLBENZ	ppb	10	5	5	***	60	EPAP	Chlorobenzene
A79	CHLTHER	ppb	10	5	5	***	.		2-Chloroethyl vinyl ether
A81	METHCHL	ppb	10	5	5	***	.		Methyl chloride [Chloromethane]
A82	CHMTHER	ppb	10	5	5	***	.		Chloromethyl methyl ether
A83	CROTONA	ppb	10	5	5	***	.		Crotonaldehyde
A84	DIBRCHL	ppb	10	5	5	***	0	EPAP	1,2-Dibromo-3-chloropropane
A85	DIBRETH	ppb	10	5	5	***	.		1,2-Dibromoethane
A86	DIBRMET	ppb	10	5	5	***	.		Dibromomethane
A87	DIBUTEN	ppb	10	5	5	***	.		1,4-Dichloro-2-butene
A88	DICDIFM	ppb	10	5	5	***	.		Dichlorodifluoromethane
A89	1,1-DIC	ppb	10	5	5	***	.		1,1-Dichloroethane
A90	1,2-DIC	ppb	10	5	5	***	5	EPA	1,2-Dichloroethane
A91	TRANDCE	ppb	10	5	5	***	70	EPAP	trans-1,2-Dichloroethene
A92	DICETHY	ppb	10	5	5	***	7	EPA	1,1-Dichloroethylene
A94	DICPANE	ppb	10	5	5	***	6	EPAP	1,2-Dichloropropane
A95	DICPENE	ppb	10	5	5	***	.		1,3-Dichloropropene

TABLE 21. (contd)

Constituent List=WAC 173-303-9905

Constituent Code	Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standards Standard	Agency Exceeded	Full name
A98	NNDIEHY	ppb	10	6	6	***	.		N,N-diethylhydrazine
A99	HYDRSUL	ppb	10	6	6	***	.		Hydrogen sulfide
B01	IODOMET	ppb	10	6	6	***	.		Iodomethane
B02	METHACR	ppb	10	6	6	***	.		Methacrylonitrile
B03	METHTHI	ppb	10	6	6	***	.		Methanethiol
B04	PENTACH	ppb	10	6	6	***	.		Pentachloroethane
B05	1112-tc	ppb	10	6	6	***	.		1,1,1,2-Tetrachlorethane
B06	1122-tc	ppb	10	6	6	***	.		1,1,2,2-Tetrachlorethane
B08	BROMORM	ppb	10	6	6	***	100	EPA	Bromoform [Tribromomethane]
B09	TRCMEOL	ppb	10	6	6	***	.		Trichloromethanethiol
B10	TRCMFLM	ppb	10	6	6	***	.		Trichloromonofluoromethane
B11	TRCPANE	ppb	10	6	6	***	.		Trichloropropane
B12	123-trp	ppb	10	6	6	***	.		1,2,3-Trichloropropane
B13	VINYIDE	ppb	10	6	6	***	2	EPA	Vinyl chloride
B15	DIETHY	ppb	10	6	6	***	.		Diethylarsine
B19	ACETILE	ppb	3000	6	6	***	.		Acetonitrile
B20	ACETOPH	ppb	10	4	4	***	.		Acetophenone
B21	WARFRIN	ppb	10	4	4	***	.		Warfarin
B22	ACEFENE	ppb	10	4	4	***	.		2-Acetylaminofluorene
B23	AMINOYL	ppb	10	4	4	***	.		4-Aminobiphenyl
B24	AMIISOX	ppb	10	4	4	***	.		5-(Aminomethyl)-3-isoxazolol
B25	AMITROL	ppb	10	4	4	***	.		Amitrole
B26	ANILINE	ppb	10	4	4	***	.		Aniline
B27	ARAMITE	ppb	10	4	4	***	.		Aramite
B28	AURAMIN	ppb	10	4	4	***	.		Auramine
B29	BENZCAC	ppb	10	4	4	***	.		Benz[c]acridine
B30	BENZAAN	ppb	10	4	4	***	.		Benz[a]anthracene
B31	BENDICM	ppb	10	4	4	***	.		Benzene, dichloromethyl
B32	BENTHOL	ppb	10	4	4	***	.		Benzenethiol
B33	BENDINE	ppb	10	4	4	***	.		Benzidine
B34	BENZBFL	ppb	10	4	4	***	.		Benzo[b]fluoranthene
B35	BENZJFL	ppb	10	4	4	***	.		Benzo[j]fluoranthene
B36	PBENZQU	ppb	10	4	4	***	.		p-Benzoquinone
B37	BENZCHL	ppb	10	4	4	***	.		Benzyl chloride
B38	BIS2CHM	ppb	10	4	4	***	.		Bis(2-chloroethoxy) methane
B39	BIS2CHE	ppb	10	4	4	***	.		Bis(2-chloroethyl) ether
B40	BIS2EPH	ppb	10	4	4	***	.		Bis(2-ethylhexyl) phthalate
B41	BROPHEN	ppb	10	4	4	***	.		4-Bromophenyl phenyl ether
B42	BUTBENP	ppb	10	4	4	***	.		Butyl benzyl phthalate
B43	BUTDINP	ppb	10	4	4	***	.		2-sec-Butyl-4,6-dinitrophenol (DNBP)
B44	CHALETH	ppb	10	4	4	***	.		Chloroalkyl ethers
B45	CHLANIL	ppb	10	4	4	***	.		p-Chloroaniline
B46	CHLCRES	ppb	10	4	4	***	.		p-Chloro-m-cresol
B47	CHLEPOX	ppb	10	4	4	***	0	EPAP	1-Chloro-2,3-epoxypropane
B48	CHLNAPH	ppb	10	4	4	***	.		2-Chloronaphthalene
B49	CHLPHEN	ppb	10	4	4	***	.		2-Chlorophenol
B50	CHRYSEN	ppb	10	4	4	***	.		Chrysene
B51	CRESOLS	ppb	10	4	4	***	.		Cresols
B52	CYCHDIN	ppb	10	4	4	***	.		2-Cyclohexyl-4,6-dinitrophenol
B53	DIBAHAC	ppb	10	4	4	***	.		Dibenz[a,h]acridine
B54	DIBAJAC	ppb	10	4	4	***	.		Dibenz[a,j]acridine
B55	DIBAHAN	ppb	10	4	4	***	.		Dibenz[a,h]anthracene
B56	DIBCGCA	ppb	10	4	4	***	.		7H-Dibenzo[c,g]carbazole
B57	DIBAEPY	ppb	10	4	4	***	.		Dibenzo[a,e]pyrene

TABLE 21. (contd)

Constituent List=WAC 173-303-9905

Constituent Code	Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standards Standard	Agency Exceeded	Full name
B58	DIBAHPY	ppb	10	4	4	***	.		Dibenzo[a,h]pyrene
B59	DIBAIPY	ppb	10	4	4	***	.		Dibenzo[a,i]pyrene
B60	DIBPHTH	ppb	10	4	4	***	.		Di-n-butyl phthalate
B61	12-dben	ppb	10	4	4	***	.		1,2-Dichlorobenzene
B62	13-dben	ppb	10	4	4	***	.		1,3-Dichlorobenzene
B63	14-dben	ppb	10	4	4	***	.		1,4-Dichlorobenzene
B64	DICHBEN	ppb	20	4	4	***	.		3,3'-Dichlorobenzidine
B65	24-dchp	ppb	10	4	4	***	.		2,4-Dichlorophenol
B66	26-dchp	ppb	10	4	4	***	.		2,6-Dichlorophenol
B67	DIEPHTH	ppb	10	4	4	***	.		Diethyl phthalate
B68	DIHYSAF	ppb	10	4	4	***	.		Dihydrosafrole
B69	DIMETHB	ppb	10	4	4	***	.		3,3'-Dimethoxybenzidine
B70	DIMEAMB	ppb	10	4	4	***	.		p-Dimethylaminoazobenzene
B71	DIMBENZ	ppb	10	4	4	***	.		7,12-Dimethylbenz[a]anthracene
B72	DIMEYLB	ppb	10	4	4	***	.		3,3'-Dimethylbenzidine
B73	THIONOX	ppb	10	4	4	***	.		Thiofanox
B74	DIMPHAM	ppb	10	4	4	***	.		alpha,alpha-Dimethylphenethylamine
B75	DIMPHEN	ppb	10	4	4	***	.		2,4-Dimethylphenol
B76	DIMPHTH	ppb	10	4	4	***	.		Dimethyl phthalate
B77	DINBENZ	ppb	10	4	4	***	.		Dinitrobenzene
B78	DINCRES	ppb	10	4	4	***	.		4,6-Dinitro-o-cresol and salts
B79	DINPHEN	ppb	50	4	4	***	.		2,4-Dinitrophenol
B80	24-dint	ppb	10	4	4	***	.		2,4-Dinitrotoluene
B81	26-dint	ppb	10	4	4	***	.		2,6-Dinitrotoluene
B82	DIOPHTH	ppb	10	4	4	***	.		Di-n-octyl phthalate
B83	DIPHAMI	ppb	10	4	4	***	.		Diphenylamine
B84	DIPHHYD	ppb	10	4	4	***	.		1,2-Diphenylhydrazine
B85	DIPRNIT	ppb	10	4	4	***	.		Di-n-propylnitrosamine
B86	ETHMINE	ppb	10	4	4	***	.		Ethyleneimine
B87	ETHMETS	ppb	10	4	4	***	.		Ethyl methanesulfonate
B88	FLUORAN	ppb	10	4	4	***	.		Fluoranthene
B89	HEXCBEN	ppb	10	4	4	***	.		Hexachlorobenzene
B90	HEXCBUT	ppb	10	4	4	***	.		Hexachlorobutadiene
B91	HEXCCYC	ppb	10	4	4	***	.		Hexachlorocyclopentadiene
B92	HEXCETH	ppb	10	4	4	***	.		Hexachloroethane
B93	INDENOP	ppb	10	4	4	***	.		Indeno(1,2,3-cd)pyrene
B94	ISOSOLE	ppb	10	4	4	***	.		Isosafrole
B95	MALOILE	ppb	10	4	4	***	.		Malononitrile
B96	MELPHAL	ppb	10	4	4	***	.		Melphalan
B97	METHAPY	ppb	10	4	4	***	.		Methapyrilene
B98	METHNYL	ppb	10	4	4	***	.		Metholonyl
B99	METAZIR	ppb	10	4	4	***	.		2-Methylaziridine
C01	METCHAN	ppb	10	4	4	***	.		3-Methylcholanthrene
C02	METBISC	ppb	10	4	4	***	.		4,4'-Methylenebis(2-chloroaniline)
C03	METACTO	ppb	10	4	4	***	.		2-Methyllactonitrile
C04	METACRY	ppb	10	5	5	***	.		Methyl methacrylate
C05	METMSUL	ppb	10	4	4	***	.		Methyl methanesulfonate
C06	METPROP	ppb	10	4	4	***	.		2-Methyl-2-(methylthio) propionaldehyde-O-(methylcarbamoyl)oxime
C07	METHIOU	ppb	10	4	4	***	.		Methylthiouracil
C08	NAPHQUI	ppb	10	4	4	***	.		1,4-Naphthoquinone
C09	1-napha	ppb	10	4	4	***	.		1-Naphthylamine
C10	2-napha	ppb	10	4	4	***	.		2-Naphthylamine

TABLE 21. (contd)

Constituent List=WAC 173-303-9905

Constituent Code	Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standards Standard	Agency Exceeded	Full name
C11	NITRANI	ppb	50	4	4	***	.		p-Nitroaniline
C12	NITBENZ	ppb	10	4	4	***	.		Nitrobenzene
C13	NITPHEN	ppb	50	4	4	***	.		4-Nitrophenol
C14	NNIBUTY	ppb	10	4	4	***	.		N-nitrosodi-n-butylamine
C15	NNIDIEA	ppb	10	4	4	***	.		N-nitrosodiethanolamine
C16	NNIDIEY	ppb	10	4	4	***	.		N-nitrosodiethylamine
C17	NNIDIME	ppb	10	4	4	***	.		N-nitrosodimethylamine
C18	NNIMETH	ppb	10	4	4	***	.		N-nitrosomethylethylamine
C19	NNIURET	ppb	10	4	4	***	.		N-nitroso-n-methylurethane
C20	NNIVINY	ppb	10	4	4	***	.		N-nitrosomethylvinylamine
C21	NNIMORP	ppb	10	4	4	***	.		N-nitrosomorpholine
C22	NNINICO	ppb	10	4	4	***	.		N-nitrosonornicotine
C23	NNIPIPE	ppb	10	4	4	***	.		N-nitrosopiperidine
C24	NITRPYR	ppb	10	4	4	***	.		Nitrosopyrrolidine
C25	NITRTOL	ppb	10	4	4	***	.		5-Nitro-o-toluidine
C26	PENTCHB	ppb	10	4	4	***	.		Pentachlorobenzene
C27	PENTCHN	ppb	10	4	4	***	.		Pentachloronitrobenzene
C28	PENTCHP	ppb	50	4	4	***	220	EPAP	Pentachlorophenol
C29	PHENTIN	ppb	10	4	4	***	.		Phenacetin
C30	PHENINE	ppb	10	4	4	***	.		Phenylenediamine
C31	PHTHEST	ppb	10	4	4	***	.		Phthalic acid esters
C32	PICOLIN	ppb	10	4	4	***	.		2-Picoline
C33	PRONIDE	ppb	10	4	4	***	.		Pronamide
C34	RESERPI	ppb	10	4	4	***	.		Reserpine
C35	RESORCI	ppb	10	4	4	***	.		Resorcinol
C36	SAFROL	ppb	10	4	4	***	.		Safrol
C37	TETRCHB	ppb	10	4	4	***	.		1,2,4,5-Tetrachlorobenzene
C39	TETRCHP	ppb	10	4	4	***	.		2,3,4,6-Tetrachlorophenol
C40	THIURAM	ppb	10	4	4	***	.		Thiuram
C41	TOLUDIA	ppb	10	4	4	***	.		Toluenediamine
C42	OTOLHYD	ppb	10	4	4	***	.		o-Toluidine hydrochloride
C43	TRICHLB	ppb	10	4	4	***	.		1,2,4-Trichlorobenzene
C44	245-trp	ppb	50	4	4	***	.		2,4,5-Trichlorophenol
C45	246-trp	ppb	10	4	4	***	.		2,4,6-Trichlorophenol
C46	TRIPHOS	ppb	10	4	4	***	.		O,o,o-triethyl phosphorothioate
C47	SYMTRIN	ppb	10	4	4	***	.		Sym-trinitrobenzene
C48	TRISPHO	ppb	10	4	4	***	.		Tris(2,3-dibromopropyl) phosphate
C49	BENZOPY	ppb	10	4	4	***	.		Benzo[a]pyrene
C50	CHLNAPZ	ppb	10	4	4	***	.		Chlornaphazine
C51	BIS2ETH	ppb	10	4	4	***	.		Bis(2-chloroisopropyl) ether
C52	HEXAENE	ppb	10	4	4	***	.		Hexachloropropene
C53	HYDRAZI	ppb	3000	4	4	***	.		Hydrazine
C54	HEXACHL	ppb	10	4	4	***	.		Hexachlorophene
C55	NAPHTHA	ppb	10	4	4	***	.		Naphthalene
C56	123TRI	ppb	10	4	4	***	.		1,2,3-Trichlorobenzene
C58	135TRI	ppb	10	4	4	***	.		1,3,5-Trichlorobenzene
C59	1234TE	ppb	10	4	4	***	.		1,2,3,4-Tetrachlorobenzene
C60	1235TE	ppb	10	4	4	***	.		1,2,3,5-Tetrachlorobenzene
C61	TETEPYR	ppb	2	4	4	***	.		Tetraethylpyrophosphate
C62	CHLLATE	ppb	30	4	4	***	.		Chlorobenzilate
C63	CARBPHT	ppb	2	4	4	***	.		Carbophenothion
C64	DISULFO	ppb	2	4	4	***	.		Disulfoton
C65	DIMETHO	ppb	2	4	4	***	.		Dimethoate

TABLE 21. (contd)

Constituent List=WAC 173-303-9905

Constituent Code	Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standards Standard	Agency Exceeded	Full name
C66	METHPAR	ppb	2	4	4	***	.		Methyl parathion
C67	PARATHI	ppb	2	4	4	***	.		Parathion
C70	CYANIDE	ppb	10	4	4	***	.		Cyanide
C71	FORMALN	ppb	500	5	5	***	.		Formalin
C77	PERCHLO	ppb	1000	5	5	***	.		Perchlorate
C78	SULFIDE	ppb	1000	4	4	***	.		Sulfide
C79	KEROSEN	ppb	10000	4	4	***	.		Kerosene
C81	ETHYGLY	ppb	10000	4	4	***	.		Ethylene glycol
C86	DIOXIN	ppb	0.1	4	4	***	.		Dioxin
C87	CITRUSR	ppb	1000	4	4	***	.		Citrus red
C90	PARALDE	ppb	2000	4	4	***	.		Paraldehyde
C91	STRYCHN	ppb	50	4	4	***	.		Strychnine
C92	MALHYDR	ppb	500	4	4	***	.		Maleic hydrazide
C93	NICOTIN	ppb	100	4	4	***	.		Nicotinic acid
C94	ACRYIDE	ppb	10000	4	4	***	0	EPAP	Acrylamide
C96	ALLYLAL	ppb	2500	4	4	***	.		Allyl alcohol
C97	CHLACET	ppb	16000	4	4	***	.		Chloroacetaldehyde
C98	CHLPROP	ppb	4000	4	4	***	.		3-Chloropropionitrile
H03	ETHCARB	ppb	5000	4	4	***	.		Ethyl carbamate
H04	ETHCYAN	ppb	2000	4	4	***	.		Ethyl cyanide
H05	ETHOXID	ppb	3000	5	5	***	.		Ethylene oxide
H06	ETHMETH	ppb	10	5	5	***	.		Ethyl methacrylate
H09	ISOBUTY	ppb	1000	4	4	***	.		Isobutyl alcohol
H11	PROPYLA	ppb	10000	4	4	***	.		n-Propylamine
H12	PROPYNO	ppb	8000	4	4	***	.		2-Propyn-1-ol
H15	2,4,5-T	ppb	2	4	4	***	.		2,4,5-T
H40	FTHALLI	ppb	5	5	5	***	.		Thallium, filtered
I21	TRIBUPH	ppb	10	4	4	***	.		Tributylphosphoric acid

*** - Indicates all samples were reported as below contractual detection limits
xxx - Indicates that Drinking Water Standards were exceeded
EPA - based on Maximum Contaminant Levels given in 40 CFR Part 141 (July,1987) National Primary Drinking Water Regulations as amended by 52 FR 25690
EPAR - based on National Interim Primary Drinking Water Regulations, Appendix IV, EPA-570/9-76-003
EPAP - based on proposed Maximum Contaminant Level Goals in 50 FR 46936
EPAS - based on Secondary Maximum Contaminant Levels given in 40 CFR Part 143 National Secondary Drinking Water Regulations
WDOE - based on additional Secondary Maximum Contaminant Levels given in WAC 248-54, Public Water Supplies

TABLE 22. Constituents with at Least One Detected Value for the 1324-N/NA Facilities, July 1988

Well name	Collection Date	Duplicate sample number	ALKALIN ppb 20000/.	ALPHA pCi/L 4/15	ALUMNUM ppb 150/.	BARIUM ppb 6/1000	FBARIUM ppb 6/1000	BETA pCi/L 8/50	FCALCIU ppb 50/.	CALCIUM ppb 50/.	CHLFORM ppb 5/100	CHLORID ppb 500/250000s
1-N-58	06JUL88		59,500	*0.901	<150	33	36	6.67	37,600	34,100	9	6,560
	06JUL88	1	.	*1.280	.	.	34	*2.59	35,800	.	9	6,550
1-N-59	06JUL88		42,500	*1.180	160	17	17	*2.05	24,500	22,200	12	6,130
1-N-60	06JUL88		98,500	*-0.529	<150	15	16	6.17	17,700	17,000	14	4,780
1-N-61	06JUL88		20,100	*-1.600	<150	34	38	*4.51	29,300	28,800	9	6,680

Well name	Collection Date	Duplicate sample number	CO-60 pCi/L 22.5/100r	COPPER ppb 10/1300p	CS-137 pCi/L 20/200r	FLUORID ppb 500/4000	IRON ppb 30/300s	MAGNES ppb 50/.	FMAGNES ppb 50/.	FMANGAN ppb 5/50s	MANGESE ppb 5/50s
1-N-58	06JUL88		*-8.930	11	*3.180	1,530	69	6,470	6,970	<5	<5
	06JUL88	1	.	.	.	1,510	.	.	6,660	<5	.
1-N-59	06JUL88		*-2.370	<10	*-2.230	1,050	42	4,690	4,950	23	27
1-N-60	06JUL88		*1.430	<10	*-0.331	1,050	34	3,330	3,410	<5	<5
1-N-61	06JUL88		*-0.508	<10	*0.954	1,400	306	6,920	6,910	15	17

Well name	Collection Date	Duplicate sample number	METHYCH ppb 10/.	NITRATE ppb 500/45000	FPOTASS ppb 100/.	POTASUM ppb 100/.	RADIUM pCi/L 1/5	RU-106 pCi/L 172.5/30r	SELENUM ppb 5/10	SODIUM ppb 200/.	FSODIUM ppb 200/.	SR-90 pCi/L 5/8
1-N-58	06JUL88		#9	2,480	2,680	2,700	*0.0812	*-36.6	<5.0	193,000	187,000	*0.0465
	06JUL88	1	15	2,400	2,560	.	.	.	.	.	189,000	.
1-N-59	06JUL88		<10	2,400	2,560	2,700	*0.0951	*13.6	6.9	199,000	187,000	*0.2490
1-N-60	06JUL88		#9	1,880	2,690	2,890	0.1540	*-11.4	<5.0	148,000	129,000	*0.1670
1-N-61	06JUL88		<10	2,430	2,340	2,480	*0.1180	*-30.9	<5.0	228,000	200,000	*0.2200

Well name	Collection Date	Duplicate sample number	FSTRONT ppb 20/.	STRONUM ppb 20/.	SULFATE ppb 500/250000s	TC ppb 1000/.	TRITIUM pCi/L 500/20000	U-CHEM ug/L 0.726/.	FVANADI ppb 5/.	VANADUM ppb 5/.	ZINC ppb 5/5000s
1-N-58	06JUL88		157	149	483,000	17,700	*55.9	3.220	<5	6	15
	06JUL88	1	150	.	485,000	.	.	3.710	<5	.	.
1-N-59	06JUL88		109	105	465,000	15,600	*149.0	4.180	<5	6	15
1-N-60	06JUL88		78	79	257,000	25,400	*227.0	0.718	16	16	9
1-N-61	06JUL88		144	145	516,000	8,390	*15.0	0.816	<5	<5	11

TABLE 23. Replicate Samples of the Indicator Parameters for the 1324-N/NA Facilities, July 1988

Well name	Collection Date	Duplicate sample number	CONDFLD umho 1/700w	CONDLAB umho ./700w	PH-LAB 0.01/8.5s	PHFIELD 0.1/8.5s	TOC ppb 1000/.	TOX ppb 100/.
1-N-58	06JUL88		1,144	1,240	7.6	5.3	#989	#21.8
		1	1,144	1,230	7.3	5.4	#990	#12.9
		2	1,146	1,230	7.3	5.3	1,010	#16.2
		3	1,146	1,250	7.4	5.4	1,080	#19.4
1-N-59	06JUL88		1,088	1,270	6.7	5.0	1,090	#9.9
		1	1,087	1,250	6.7	4.9	#924	#14.6
		2	1,089	1,260	6.7	5.0	#909	#18.2
		3	1,088	1,240	6.8	5.0	#998	#33.6
1-N-60	06JUL88		761	825	8.1	5.9	#766	#24.4
		1	783	827	8.2	5.9	#708	#11.5
		2	764	822	8.2	5.8	#763	#11.8
		3	766	827	8.2	5.9	#795	#13.3
1-N-61	06JUL88		1,204	1,240	6.6	6.2	1,460	#81.8
		1	1,202	1,230	6.7	6.3	1,410	#78.2
		2	1,206	1,230	6.7	6.3	1,310	#31.6
		3	1,202	1,240	6.6	6.3	1,370	351.0

The column headers consist of : Constituent Name
Analysis Units
Contractual Detection Limit/Drinking Water Standard(suffix)

Suffix
none - based on Maximum Contaminant Levels given in 40 CFR Part 141 (July,1987) National Primary Drinking Water Regulations as amended by 52 FR 25690
r - based on National Interim Primary Drinking Water Regulations, Appendix IV, EPA-570/9-76-003
p - based on proposed Maximum Contaminant Level Goals in 50 FR 46936
s - based on Secondary Maximum Contaminant Levels given in 40 CFR Part 143 (July, 1987) National Secondary Drinking Water Regulations
w - based on additional Secondary Maximum Contaminant Levels given in WAC 248-54, Public Water Supplies

Data flags
< - Less than Contractual Detection Limit, reported as Limit
- Less than Contractual Detection Limit, measured value reported
* - For radioactive constituents, reported value is less than 2-sigma error

1325-N LIQUID WASTE DISPOSAL FACILITY

T. J. Gilmore

Progress on the RCRA interim-status detection-level ground-water monitoring project at the 1325-N Liquid Waste Disposal Facility (LWDF) for the period from July 1 to September 30, 1988, is presented below. The project scope is outlined in the draft Closure/Post-Closure Plan for the 1325-N LWDF presented to Westinghouse Hanford Company by PNL in June 1987 and in the draft Interim Status Detection-Level Ground-Water Monitoring Plan for the 1325-N Liquid Waste Disposal Facility presented to Westinghouse Hanford Company by PNL in March 1988. Previously issued reports have reported progress in the first and second quarters of 1988 (PNL 1988c,d).

The facility is located approximately 200 ft east of the Columbia River. It consists of a concrete 240-by-250-ft basin with an extension trench that is approximately 3000 ft long, 55 ft wide, and 7 ft deep (Figure 19).

The 1325-N LWDF is the primary liquid waste disposal system for the N Reactor. The facility began operation in 1983 and was in use until the N Reactor went on cold standby early in 1988.

DRILLING AND HYDROGEOLOGIC CHARACTERIZATION

No drilling was conducted this quarter. Hydrogeologic characterization activities are discussed below.

Hydrogeologic Characterization

Water-level measurements are taken in most of the usable pre-existing 100-N Area wells to characterize the ground-water system near the 1325-N LWDF. Monthly water-level measurements were continued this quarter, with measurements taken in 43 wells in July, 44 wells in August, and 45 wells in September. Water table maps for each month are shown in Figures 15, 16, and 17.

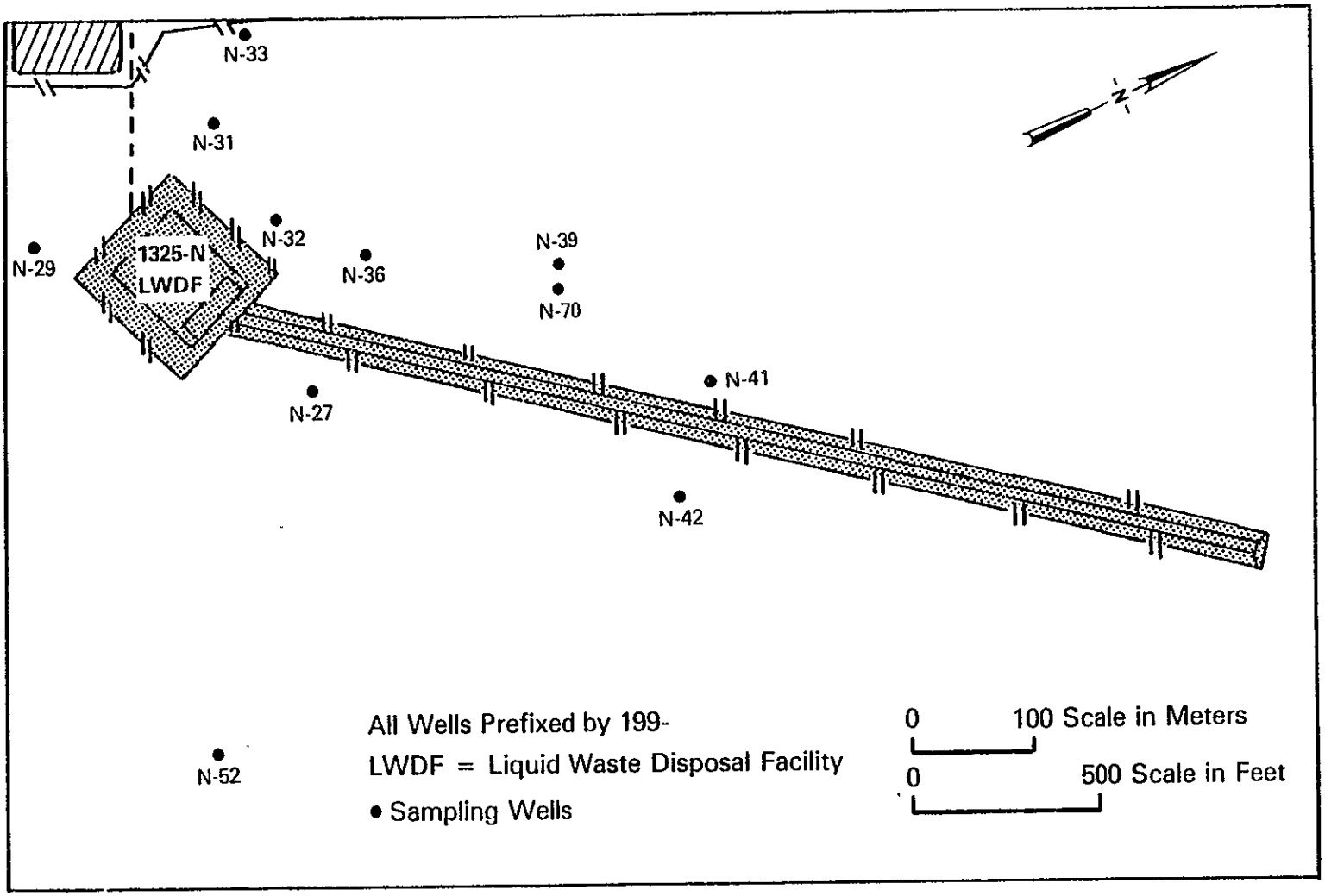

FIGURE 19. Monitoring Well Locations for the 1325-N Liquid Waste Disposal Facility

Initial Ground-Water Sampling

A composite water sample was collected from well 199-N-70 during aquifer testing to determine the contamination present in the ground-water before quarterly sampling. Water samples were taken at the beginning, middle, and end of the aquifer test and combined to obtain a composite sample. The results from this initial sampling are shown in Table 24.

GROUND-WATER SAMPLING AND ANALYSIS

Quarterly sampling has been conducted on 11 wells surrounding the 1325-N LWDF since December 1987 (Table 25). These 11 wells were pre-existing Hanford Site wells. The analytical results of the sampling on June 28 and 30, 1988, are included in Tables 26, 27, and 28. One new well, 199-N-70, was added to the network sampling in September.

Collection and Analysis

Each sample was analyzed for the interim primary drinking water standards given in 40 CFR 265, water quality parameters, contamination indicators, and specific dangerous waste constituents known to have been

TABLE 24. Composite Ground-Water Analysis from Well 199-N-70, June 1988 (sample taken during aquifer testing)

Constituent (unit)	Result	Counting Error
Beta (pCi/L)	7.05E+01(a)	1.11E+02
Lo Alpha (pCi/L)	2.18E+00(a)	2.09E+01
Plutonium-239,240 (pCi/L)	1.92E-04(a)	9.40E-03
Plutonium-238 (pCi/L)	1.69E-03(a)	1.34E-02
Tritium (pCi/L)	1.03E+05	1.20E+03
Strontium-90 (pCi/L)	2.08E+01(a)	7.40E-01
Cobalt-60 (pCi/L)	8.79E+01	1.66E+01
Cesium-137 (pCi/L)	2.15E+00(a)	4.11E+00
Ruthenium-106 (pCi/L)	4.85E+01	4.79E+01

(a) Denotes less than overall counting error.

TABLE 25. Sample Collection Schedule for the 1325-N Liquid Waste Disposal Facility

Well Number	1987 Oct	1987 Nov	1987 Dec	1988 Jan	1988 Feb	1988 Mar	1988 Apr	1988 May	1988 Jun	1988 Jul	1988 Aug	1988 Sep
199-N-27			X			X			X			X
199-N-29		X				X			X			X
199-N-31			X			X			X			X
199-N-32			X			X			X			X
199-N-33			X			X			X			X
199-N-36			X			X			X			X
199-N-39			X			X			X			X
199-N-41			X			X			X			X
199-N-42			X			X			X			X
199-N-52			X			X			X			X
199-N-70												X
699-81-58			X			X			X			X

discharged to the facility. The site-specific constituents tritium, strontium-90, natural uranium, cobalt-60, cesium-137, ruthenium-106, phenols, ammonia, and hydrazine, which were added to the list of analyses for the June 1988 sampling, were also included. An analytical method providing a lower detection limit for total organic halogens was used to analyze samples collected during June 1988.

Discussion of Results

The gross beta radiation in 10 of the 11 wells exceeded the drinking water standard of 50 pCi/L. Well 699-81-58, a regional upgradient well, was the only one with activities below the drinking water standard for gross beta. The beta-emitting constituents that are in part responsible for the gross beta readings are cobalt-60 and strontium-90. In wells 199-N-27 and 199-N-36, cobalt-60 exceeded the drinking water standard, and in wells 199-N-29, 199-N-31, 199-N-32, 199-N-33, 199-N-36, and 199-N-39 the strontium-90 drinking water standard was exceeded. Nitrate concentrations were above the drinking water standard in wells 199-N-32 and 199-N-41.

TABLE 26. Summary of Sampling Results for the 1325-N Liquid Waste Disposal Facility, June 1988

Constituent List=Contamination Indicator Parameters

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standard	Standard Agency	Exceeded	Full name
191	CONDFLD	umho	1	44	0		700	WDOE		Specific conductance, field
199	PHFIELD		0.1	44	0		6.5-8.5	EPAS	xxx	pH, field
C68	TOX	ppb	100	44	0		.			Total organic halogen
C69	TOC	ppb	1000	44	0		.			Total organic carbon

Constituent List=Drinking Water Parameters

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standard	Standard Agency	Exceeded	Full name
109	COLIFRM	MPN	2.2	11	11	***	1	EPA		Coliform bacteria
111	BETA	pCi/L	8	12	0		50	EPA	xxx	Gross beta
181	RADIUM	pCi/L	1	12	0		5	EPA		Total radium
212	ALPHA	pCi/L	4	12	0		15	EPA		Gross alpha
A06	BARIUM	ppb	6	12	0		1000	EPA		Barium
A07	CADMIUM	ppb	2	12	12	***	10	EPA		Cadmium
A09	CHROMUM	ppb	10	12	11		50	EPA		Chromium
A10	SILVER	ppb	10	12	12	***	50	EPA		Silver
A20	ARSENIC	ppb	5	12	10		50	EPA		Arsenic
A21	MERCURY	ppb	0.1	11	11	***	2	EPA		Mercury
A22	SELENUM	ppb	5	12	12	***	10	EPA		Selenium
A33	ENDRIN	ppb	0.1	11	11	***	0.2	EPA		Endrin
A34	METHLOR	ppb	3	11	11	***	100	EPA		Methoxychlor
A35	TOXAENE	ppb	1	11	11	***	5	EPA		Toxaphene
A36	a-BHC	ppb	0.1	11	11	***	4	EPA		Alpha-BHC
A37	b-BHC	ppb	0.1	11	11	***	4	EPA		Beta-BHC
A38	g-BHC	ppb	0.1	11	11	***	4	EPA		Gamma-BHC
A39	d-BHC	ppb	0.1	11	11	***	4	EPA		Delta-BHC
A51	LEADGF	ppb	5	12	12	***	50	EPA		Lead (graphite furnace)
C72	NITRATE	ppb	500	12	0		45000	EPA	xxx	Nitrate
C74	FLUORID	ppb	500	12	12	***	4000	EPA		Fluoride
H13	2,4-D	ppb	2	11	11	***	100	EPA		2,4-D [2,4-Dichlorophenoxyacetic acid]
H14	2,4,5TP	ppb	2	11	11	***	10	EPA		2,4,5-TP silvex
H20	FBARIUM	ppb	6	12	0		1000	EPA		Barium, filtered
H21	FCADMIU	ppb	2	12	12	***	10	EPA		Cadmium, filtered
H22	FCHROMI	ppb	10	12	11		50	EPA		Chromium, filtered
H23	FSILVER	ppb	10	12	12	***	50	EPA		Silver, filtered
H37	FARSENI	ppb	5	12	7		50	EPA		Arsenic, filtered
H38	FMERCUR	ppb	0.1	11	11	***	2	EPA		Mercury, filtered
H39	FSELENI	ppb	5	12	12	***	10	EPA		Selenium, filtered
H41	FLEAD	ppb	5	12	12	***	50	EPA		Lead, filtered

TABLE 26. (contd)

Constituent List=Water Quality Parameters

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standard	Standards Agency	Exceeded	Full name
A11	SODIUM	ppb	200	12	0		.			Sodium
A17	MANGESE	ppb	5	12	11		50	EPAS		Manganese
A19	IRON	ppb	30	12	4		300	EPAS	xxx	Iron
C73	SULFATE	ppb	500	12	0		250000	EPAS		Sulfate
C75	CHLORID	ppb	500	12	0		250000	EPAS		Chloride
H24	FSODIUM	ppb	200	12	0		.			Sodium, filtered
H29	FMANGAN	ppb	5	12	12	***	50	EPAS		Manganese, filtered
H31	FIRON	ppb	30	12	12	***	300	EPAS		Iron, filtered
H67	LPHENOL	ppb	10	12	12	***	.			Phenol, low DL

Constituent List=Site Specific and Other Parameters

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standard	Standards Agency	Exceeded	Full name
010	CO-60	pCi/L	22.5	12	0		100	EPAR	xxx	Cobalt-60
024	CS-137	pCi/L	20	12	0		200	EPAR		Cesium-137
034	RU-106	pCi/L	172.5	12	0		30	EPAR		Ruthenium-106
037	SB-125	pCi/L	48	4	0		300	EPAR		Antimony-125
108	TRITIUM	pCi/L	500	12	0		20000	EPA	xxx	Tritium (H-3)
121	SR-90	pCi/L	5	12	0		8	EPA	xxx	Strontium-90
124	U-CHEM	ug/L	0.725	12	0		.			Uranium, chemical
A04	ZINC	ppb	5	12	5		5000	EPAS		Zinc
A05	CALCIUM	ppb	50	12	0		.			Calcium
A12	NICKEL	ppb	10	12	12	***	.			Nickel
A13	COPPER	ppb	10	12	12	***	1300	EPAP		Copper
A14	VANADUM	ppb	5	12	1		.			Vanadium
A16	ALUMNUM	ppb	150	12	12	***	.			Aluminum
A18	POTASUM	ppb	100	12	0		.			Potassium
A50	MAGNES	ppb	50	12	0		.			Magnesium
A54	AR1016	ppb	1	12	12	***	0	EPAP		Arochlor 1016
A55	AR1221	ppb	1	12	12	***	0	EPAP		Arochlor 1221
A56	AR1232	ppb	1	12	12	***	0	EPAP		Arochlor 1232
A57	AR1242	ppb	1	12	12	***	0	EPAP		Arochlor 1242
A58	AR1248	ppb	1	12	12	***	0	EPAP		Arochlor 1248
A59	AR1254	ppb	1	12	12	***	0	EPAP		Arochlor 1254
A60	AR1260	ppb	1	12	12	***	0	EPAP		Arochlor 1260
A61	TETRANE	ppb	5	12	12	***	5	EPA		Tetrachloromethane [Carbon Tetrachloride
A64	METHONE	ppb	10	12	12	***	.			Methyl ethyl ketone
A67	1,1,1-T	ppb	5	12	12	***	200	EPA		1,1,1-Trichloroethane
A68	1,1,2-T	ppb	5	12	12	***	.			1,1,2-Trichloroethane
A69	TRICENE	ppb	5	12	12	***	5	EPA		Trichloroethylene [1,1,2-Trichloroethene
A70	PERCENE	ppb	5	12	12	***	.			Perchloroethylene
A71	OPXYLE	ppb	5	12	12	***	440	EPAP		Xylene-o,p
A80	CHLFORM	ppb	5	12	9		100	EPA		Chloroform [Trichloromethane]
A93	METHYCH	ppb	10	12	10		.			Methylene chloride
B14	M-XYLE	ppb	5	12	12	***	440	EPAP		Xylene-m
C76	PHOSPHA	ppb	1000	12	12	***	.			Phosphate
C80	AMMONIU	ppb	50	12	10		.			Ammonium ion
H18	FZINC	ppb	5	12	5		5000	EPAS		Zinc, filtered
H19	FCALCIU	ppb	50	12	0		.			Calcium, filtered
H25	FNICKEL	ppb	10	12	12	***	.			Nickel, filtered
H26	FCOPPER	ppb	10	12	12	***	1300	EPAP		Copper, filtered
H27	FVANADI	ppb	5	12	2		.			Vanadium, filtered
H28	FALUMIN	ppb	150	12	12	***	.			Aluminum, filtered
H30	FPOTASS	ppb	100	12	0		.			Potassium, filtered

TABLE 26. (contd)

H32 FMAGNES	ppb	50	12	0		.	Magnesium, filtered
H62 LHYDRAZ	ppb	30	11	11	***	.	Hydrazine, low DL
H68 HEXONE	ppb	10	12	12	***	.	Hexone

*** - Indicates all samples were reported as below contractual detection limits
xxx - Indicates that Drinking Water Standards were exceeded
EPA - based on Maximum Contaminant Levels given in 40 CFR Part 141 (July,1987) National Primary Drinking Water Regulations as amended by 52 FR 25690
EPAR - based on National Interim Primary Drinking Water Regulations, Appendix IV, EPA-570/9-76-003
EPAP - based on proposed Maximum Contaminant Level Goals in 50 FR 46936
EPAS - based on Secondary Maximum Contaminant Levels given in 40 CFR Part 143 National Secondary Drinking Water Regulations
WDOE - based on additional Secondary Maximum Contaminant Levels given in WAC 248-54, Public Water Supplies

TABLE 27. Replicate Samples of Indicator Parameters for the 1325-N Liquid Waste Disposal Facility, June 1988

Well name	Collection Date	Duplicate sample number	CONDFLD umho 1/700w	PHFIELD 0.1/8.5s	TOC ppb 1000/.	TOX ppb 100/.
1-N-27	28JUN88		181	8.2	#563	#7.8
		1	182	8.3	#679	#1.4
		2	181	8.3	#480	#10.2
		3	181	8.3	#489	#12.3
1-N-29	28JUN88		159	8.1	#604	#11.9
		1	159	8.2	#482	#12.7
		2	159	8.3	#518	#1.4
		3	159	8.2	#463	#1.1
1-N-31	28JUN88		199	7.1	#462	#11.0
		1	195	7.3	#485	#2.5
		2	196	7.4	#393	#5.2
		3	196	7.4	#443	#1.0
1-N-32	28JUN88		252	8.3	#397	#2.8
		1	193	8.2	#388	#15.9
		2	245	8.3	#390	#1.4
		3	248	8.3	#430	#1.2
1-N-33	28JUN88		187	8.3	#349	#2,310
		1	188	8.2	#365	#1,750
		2	188	8.4	#376	#1,750
		3	188	8.1	#476	#1,970
1-N-36	28JUN88		164	8.2	#550	#9.0
		1	165	8.0	#428	#0.9
		2	164	8.1	#621	#0.7
		3	164	8.2	#620	#6.2
1-N-39	29JUN88		187	8.6	#407	#9.9
		1	195	8.5	#464	#11.6
		2	189	8.5	#434	#-2.6
		3	187	8.6	#412	#17.1
1-N-41	30JUN88		233	7.6	#378	#0.1
		1	231	7.5	#332	#3.8
		2	230	7.6	#284	#13.6
		3	230	7.5	#278	#-2.7
1-N-42	29JUN88		164	8.0	#357	#13.0
		1	170	7.9	#272	#-5.9
		2	164	8.0	#164	#2.3
		3	160	8.0	#396	#3.5
1-N-52	30JUN88		171	7.8	#258	#19.5
		1	170	7.9	#238	#2.8
		2	170	7.8	#300	#18.6
		3	170	7.9	#282	#5.0
6-81-58	30JUN88		208	7.8	#240	#-4.7
		1	209	7.8	#220	#-2.1
		2	208	7.8	#225	#-0.6
		3	209	7.8	#200	#-7.2

TABLE 28. Constituents Resampled at the 1325-N Liquid Waste Disposal Facility, June 1988

Well name	Collection Date	Duplicate sample number	ALPHA pCi/L 4/15	AMMONIU ppb 50/.	ARSENIC ppb 5/50	FARSENI ppb 5/50	BARIUM ppb 6/1000	FBARIUM ppb 6/1000	BETA pCi/L 8/50	FCALCIU ppb 50/.	CALCIUM ppb 50/.
1-N-27	28JUN88		0.9880	530	<5	<5	17	14	670.00	21,600	23,600
1-N-29	28JUN88		*0.4680	560	<5	<5	11	9	1,890.00	19,800	19,700
1-N-31	28JUN88		1.3600	<50	<5	<5	19	17	219.00	29,000	29,900
1-N-32	28JUN88		1.5300	<50	<5	5	26	24	151.00	37,000	40,000
1-N-33	28JUN88		*0.7270	<50	<5	<5	18	16	1,030.00	27,800	29,400
	28JUN88	1	*0.6040	<50	<5	5	19	16	968.00	28,800	30,000
1-N-36	28JUN88		*0.4620	<50	<5	<5	17	14	586.00	24,500	27,000
1-N-39	29JUN88		*0.5630	<50	<5	<5	19	22	1,730.00	29,800	28,000
1-N-41	30JUN88		*0.2260	<50	7	7	22	26	102.00	32,100	31,600
1-N-42	29JUN88		*0.6490	<50	<5	7	15	17	94.70	23,100	23,200
1-N-52	30JUN88		*0.0143	<50	8	9	18	26	64.30	25,400	22,100
6-81-58	30JUN88		*0.7070	<50	<5	<5	14	16	*2.07	25,500	25,600

Well name	Collection Date	Duplicate sample number	CHLFORM ppb 5/100	CHLORID ppb 500/250000s	FCHROMI ppb 10/50	CHROMUM ppb 10/50	CO-60 pCi/L 22.5/100r	CS-137 pCi/L 20/200r	IRON ppb 30/300s	MAGNES ppb 50/.	FMAGNES ppb 50/.
1-N-27	28JUN88		<5	822	<10	<10	102.00	*5.260	46	4,600	4,410
1-N-29	28JUN88		#3	671	<10	<10	99.40	*5.590	<30	3,100	3,300
1-N-31	28JUN88		#3	747	<10	<10	63.10	*-0.662	38	4,960	5,130
1-N-32	28JUN88		<5	724	<10	<10	82.70	*3.010	<30	7,980	7,810
1-N-33	28JUN88		<5	819	<10	<10	66.30	*2.320	98	4,760	4,800
	28JUN88	1	<5	786	<10	<10	72.30	*4.470	73	4,820	4,980
1-N-36	28JUN88		#3	764	<10	<10	120.00	*4.130	39	4,870	4,700
1-N-39	29JUN88		<5	896	<10	<10	63.60	*-0.376	<30	5,540	5,820
1-N-41	30JUN88		<5	1,520	<10	<10	98.90	*0.376	166	7,240	7,250
1-N-42	29JUN88		<5	989	<10	<10	93.70	*0.708	1,250	5,790	5,680
1-N-52	30JUN88		<5	1,280	<10	<10	58.60	*4.570	<30	6,400	7,250
6-81-58	30JUN88		<5	1,390	11	11	*4.07	*0.318	79	7,430	7,230

Well name	Collection Date	Duplicate sample number	MANGESE ppb 5/50s	METHYCH ppb 10/.	NITRATE ppb 500/45000	FPOTASS ppb 100/.	POTASUM ppb 100/.	RADIUM pCi/L 1/5	RU-106 pCi/L 172.5/30r	SB-125 pCi/L 48/300r	SODIUM ppb 200/.
1-N-27	28JUN88		<5	<10	16,700	2,960	3,120	*0.01090	*44.40	.	3,150
1-N-29	28JUN88		<5	<10	12,300	1,950	1,810	*0.08830	*31.60	142	1,280
1-N-31	28JUN88		<5	<10	31,800	2,680	2,560	*0.12600	*25.30	117	2,240
1-N-32	28JUN88		<5	<10	56,800	3,490	3,540	*0.03390	*-8.34	.	3,340
1-N-33	28JUN88		<5	<10	29,600	2,570	2,470	*0.08640	*50.50	.	2,540
	28JUN88	1	<5	<10	29,500	2,640	2,490	*-0.06210	*-22.10	90	2,530
1-N-36	28JUN88		<5	<10	20,000	2,030	2,130	*0.00609	*-28.50	138	2,320
1-N-39	29JUN88		<5	20	30,900	3,060	2,890	*0.05610	*29.40	.	3,360
1-N-41	30JUN88		<5	<10	64,200	3,630	3,620	*0.09630	*42.40	.	5,770
1-N-42	29JUN88		5	#4	28,200	3,390	3,450	*0.02130	*55.60	.	6,810
1-N-52	30JUN88		<5	<10	25,800	4,140	3,420	0.16400	*8.99	.	6,000
6-81-58	30JUN88		<5	<10	2,190	2,600	2,590	0.28600	*24.80	.	4,460

TABLE 28. (contd)

Well name	Collection Date	Duplicate sample number	FSODIUM ppb 200/.	SR-90 pCi/L 5/8	SULFATE ppb 500/250000s	TRITIUM pCi/L 500/20000	U-CHEM ug/L 0.725/.	FVANADI ppb 5/.	VANADUM ppb 5/.	ZINC ppb 5/5000s	FZINC ppb 5/5000s
1-N-27	28JUN88		3,010	193.000	8,170	94,100	1.000	12	12	5	<5
1-N-29	28JUN88		1,490	697.000	7,020	77,000	0.481	<5	7	<5	<5
1-N-31	28JUN88		2,160	26.800	7,560	88,800	0.844	<5	8	<5	<5
1-N-32	28JUN88		3,350	12.600	8,880	70,500	1.580	10	14	8	5
1-N-33	28JUN88		2,940	368.000	8,010	89,500	0.765	9	12	5	<5
	28JUN88	1	2,750	376.000	8,050	89,700	0.797	9	14	<5	6
1-N-36	28JUN88		2,270	191.000	7,790	97,500	0.769	8	9	5	6
1-N-39	29JUN88		3,590	646.000	9,950	61,600	0.743	14	12	<5	7
1-N-41	30JUN88		5,900	*-0.205	11,000	121,000	0.494	20	18	40	27
1-N-42	29JUN88		6,840	*0.130	8,860	127,000	0.638	28	29	13	7
1-N-52	30JUN88		7,100	*-0.276	11,600	62,600	0.779	30	26	7	6
6-81-68	30JUN88		4,610	*-0.284	14,600	*156	1.060	8	<5	<5	<5

The column headers consist of : Constituent Name
Analysis Units
Contractual Detection Limit/Drinking Water Standard(suffix)

Suffix
none - based on Maximum Contaminant Levels given in 40 CFR Part 141 (July,1987) National Primary Drinking Water Regulations as amended by 52 FR 25690
r - based on National Interim Primary Drinking Water Regulations, Appendix IV, EPA-570/9-76-003
p - based on proposed Maximum Contaminant Level Goals in 50 FR 46936
s - based on Secondary Maximum Contaminant Levels given in 40 CFR Part 143 (July, 1987) National Secondary Drinking Water Regulations
w - based on additional Secondary Maximum Contaminant Levels given in WAC 248-54, Public Water Supplies

Data flags
< - Less than Contractual Detection Limit, reported as Limit
- Less than Contractual Detection Limit, measured value reported
* - For radioactive constituents, reported value is less than 2-sigma error

The concentrations of coliform in well 199-N-32 dropped below the drinking water standard, down from the previous quarter.

High TOX values were reported in well 199-N-33. These are the first TOX data measured in this well, and additional samples must be collected to verify the results. The sample was also analyzed for a limited set of volatile organic constituents, although the results showed nothing that would explain these high TOX values. If high TOX values are also obtained in the next quarterly sampling, a more thorough analyses will be conducted to determine the constituents that may be contributing to these high values.

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216-A-10 CRIB

S. P. Luttrell

The 216-A-10 crib has been proposed for closure as an interim-status facility under RCRA. Based on the draft Ground-Water Monitoring Plan, six new ground-water monitoring wells were installed this quarter. These, combined with the two existing wells, will provide interim-status detection-level ground-water monitoring at the 216-A-10 crib.

The 216-A-10 crib is a cross-sectionally v-shaped crib approximately 45 ft deep and 275 ft long and located in the 200-East Area (Figure 20). It received startup wastes from the Plutonium Uranium Extraction (PUREX) Plant 400 ft to the north during a 4-month period in 1956, but did not begin continuous service until 1961 when it replaced the retired 216-A-5 crib. The crib operated continuously from 1961 to 1973 and sporadically in 1977, 1978, and 1981.

DRILLING AND HYDROGEOLOGIC CHARACTERIZATION

This section discusses the status of activities to date relating to drilling and constructing ground-water monitoring wells, and hydrogeologic characterization at the 216-A-10 crib.

Drilling

Six new wells (299-E17-19, 299-E17-20, 299-E24-16, 299-E24-17, 299-E24-18, and 299-E25-36) were drilled and constructed at the 216-A-10 crib during this reporting period (Figure 20). The wells were essentially completed by September 29; however, final well development and pump installation were not completed until October 16.

The wells were drilled with cable-tool drilling rigs. Temporary drive casing was installed during drilling and was withdrawn while the filter pack and annular seal materials were installed. The final well construction consists of 4-in.-dia 10-slot (0.010-in.) stainless steel screens and flush-joint threaded stainless steel casings. The 20-ft long, 4-in.-dia screens

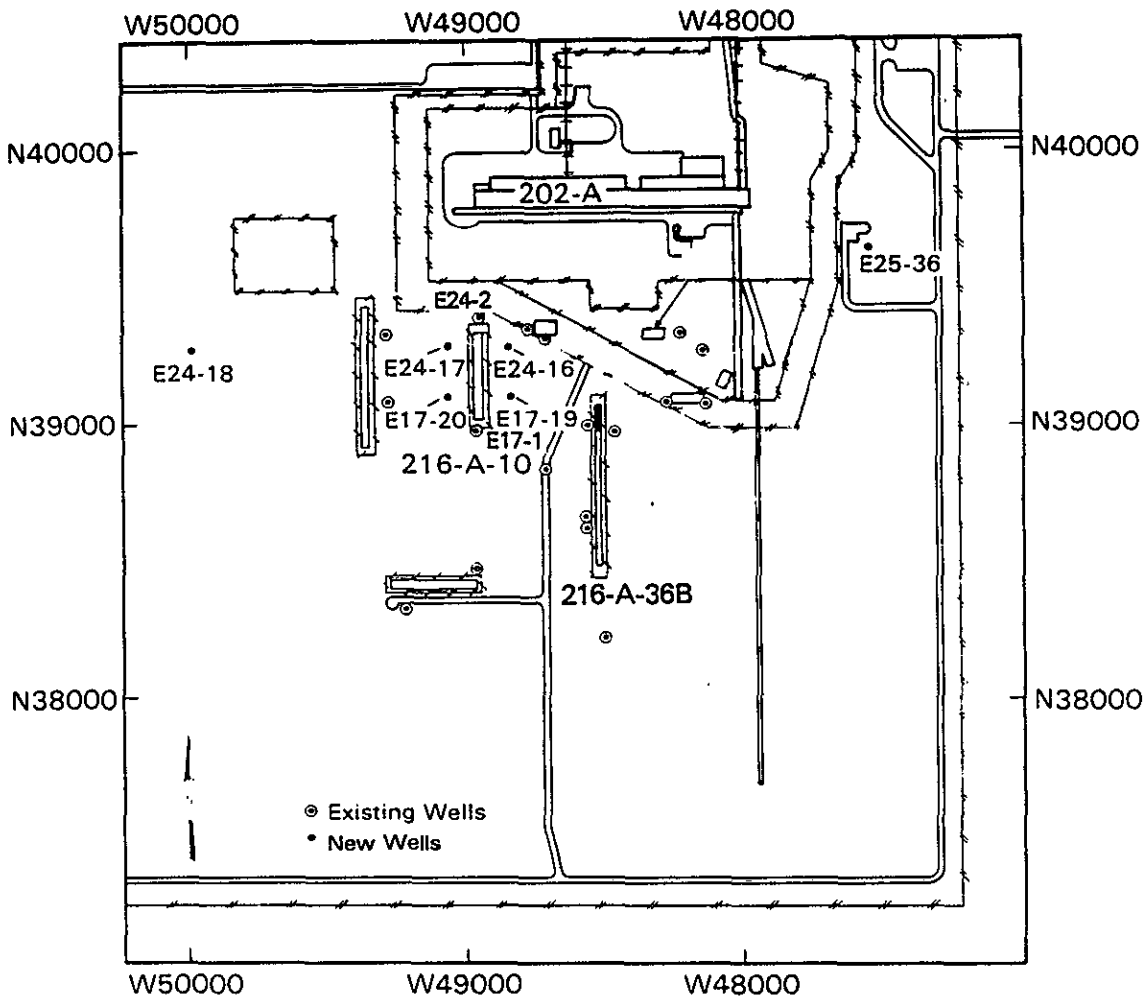

FIGURE 20. Monitoring Well Locations for the 216-A-10 Crib

extend approximately 15 to 18 ft below and approximately 2 to 5 ft above the water table. The screened portions of the completed wells were constructed within nominal 8-in.-dia telescoping screens, which were set in all wells.

Onsite monitoring was conducted with both Geiger-Muller (GM) radiation detection meters and HNU[a] photoionization detection meters for radiation

(a) This photoionization detection meter is a product of HNU Systems, Incorporated, Newton, Massachusetts.

and organic vapors during drilling and construction. Radioactive and chemical contamination was encountered during drilling at the four wells located nearest the crib (well 299-E17-19, 299-E17-20, 299-E24-16, and 299-E24-17, shown in Figure 20). Radiation zones were established around the individual wells, and radiation work procedures were followed while drilling through radioactively contaminated materials and while removing temporary casing that had become contaminated. Appropriate level "B" or level "C" personnel protective equipment (PPE) was worn when drilling through and handling chemically contaminated materials. Level B PPE included pressure-demand supplied-air respirator, Tyvek coveralls, and gloves in addition to standard safety equipment required for drilling activities. This level of protection was used when contamination had been indicated by the HNU meter and before the specific contaminants were identified. Air samples were collected and analyzed to identify the contamination; these analyses indicated the presence of C_{11} and C_{12} chain aliphatic hydrocarbons. The appropriate air-purifying air-cannister respirators, constituting level C PPE, were worn thereafter when contamination was detected. All site personnel had previously received hazardous materials handling training, which includes training in the use of onsite monitoring equipment (HNU meters) and level B and C PPE. Radioactively contaminated materials were handled, contained, transported, and disposed of according to Westinghouse Hanford Company procedures.

A construction summary of each well is provided in Table 29.

TABLE 29. Construction Summary for Wells Drilled at the 216-A-10 Crib

Local Well Number	Start Date	Completion Date[a]	Total Depth Drilled (ft)[b]	Depth to Water (ft)[b]	Screened Interval (ft)[b]	Aquifer Test (?)
299-E17-19	08-01-88	09-19-88	326.7	310.7	304.4-324.4	No
299-E17-20	08-03-88	09-28-88	327.4	308.9	303.6-323.6	Yes
299-E24-16	08-05-88	09-19-88	329.3	308.7	304.4-324.4	No
299-E24-17	07-20-88	09-19-88	329.0	309.7	308.9-328.9	No
299-E24-18	07-18-88	09-19-88	329.1	309.7	307.5-327.5	Yes
299-E25-36	07-07-88	09-19-88	317.8	297.9	297.2-317.2	No

(a) Completion dates indicate when the protective casing, concrete apron, and protective posts were all installed.
(b) Depth measurements were made with calibrated steel tapes and/or standardized electric tapes, and are relative to land surface. The values given are not necessarily absolute because of changing reference points during the drilling and construction process.

TABLE 30. Analytical Results of Ground-Water Samples Collected from Wells at the 216-A-10 Crib Before Well Development and/or Hydrologic Testing

Constituent (unit)[a]	Well Number					
	299-E17-19	299-E17-20	299-E24-16	299-E24-17	299-E24-18	299-E25-36
Total alpha (pCi/L)	2.35 ± 0.77	3.74 ± 0.92	4.57 ± 1.0	1.48 ± 0.72	5.18 ± 0.99	1.21 ± 0.58
Total beta (pCi/L)	36.4 ± 4.8	35.4 ± 5.2	73.2 ± 8.0	80.1 ± 9.9	27.6 ± 4.3	10.3 ± 2.4
Strontium-90 (pCi/L)	Less than error	7.2 ± 1.5	9.82 ± 1.32	9.7 ± 1.3	Less than error	Less than error
Iodine-129 (pCi/L)	25.9 ± 2.6	35.8 ± 2.8	19.7 ± 1.32	15.9 ± 1.7	15.7 ± 2.1	3.25 ± 1.0
Tritium (pCi/L)	4,760,000 ± 175,000	5,600,000 ± 200,000	4,700,000 ± 170,000	4,400,000 ± 165,000	2,400,000 ± 86,000	5,300 ± 210
TOC (ppm)	0.85	0.65	0.60	0.66	1.17	0.68
NO_3 (ppm)	138	241	151	175	85	5.4

(a) Gamma scan results were less than the overall error (2 sigma) and are therefore not reported.

Water samples were collected for analysis of selected constituents in accordance with an effluent monitoring plan to determine appropriate disposal methods during well development and aquifer testing. The results of the analyses are given in Table 30. When ground water exceeded or was expected to exceed Westinghouse Hanford Company Internal Criteria and Standards, the water could not be discharged directly to the ground surface, but was contained for disposal to an existing waste-water disposal facility. Aquifer test discharge water was piped directly to the 216-A-45 Crib.

Hydrogeologic Characterization

The hydrogeologic characterization effort included the collection and field description of geologic samples during drilling, determinations of moisture content, collection of sediment samples for analysis of radionuclide and chemical contamination indicators, and hydrologic testing.

Samples were collected for textural and lithologic description at a minimum of every 5 ft. Moisture content analyses were conducted by PNL on samples collected by drive barrel from intervals in which no water had been added. Samples were also collected at selected intervals for chemical analyses, which were conducted by UST. Borehole geophysical logs (gamma, neutron, and density) were run in each borehole before well construction.

Hydrologic tests were conducted in wells 299-E17-20 and 299-E24-18 before setting the 4-in. screens and casings. Water was pumped from each well and drawdown was measured in the pumped well. Preliminary "step-development" tests were conducted before the constant-discharge tests to develop the well and to predict maximum discharge rates and drawdowns. The discharge rates for the constant-discharge tests in wells 299-E17-20 and 299-E24-18 were approximately 195 and 180 gpm, respectively. The maximum drawdown observed at the end of pumping was approximately 0.15 ft in well 299-E17-20. The drawdown from well 299-E24-18 was negligible. The duration of each test was approximately 2 h. Two additional water samples were collected during the test of well 299-E17-20.

Sediment samples were collected from wells 299-E17-19, 299-E17-20, 299-E24-16, and 299-E24-17 for analysis of contamination indicators approximately every 10 ft between 20 and 150 ft, and every 20 ft from 170 ft to

250 ft (to 290 ft in well 299-E17-19). Analyses were conducted for total beta, total alpha, gamma scan, nitrate, and total organic carbon. The pH of the sediment was measured at most 5-ft intervals to the depths indicated above for each well.

GROUND-WATER SAMPLING AND ANALYSIS

Sampling and analysis of the ground water from the wells at the 216-A-10 crib has not yet begun.

216-A-29 DITCH

S. P. Luttrell

Based on the draft Ground-Water Monitoring Plan, two new wells were installed at the 216-A-29 ditch in 1988. These, with the two wells planned for construction in 1989 and the three existing wells, will provide the ditch with a detection-level ground-water monitoring system. Activities conducted during this reporting period include drilling, aquifer testing, and completion of these two new wells.

The 216-A-29 ditch (Figure 21) is a manmade earthen ditch approximately 6 ft wide and 6500 ft long that has been in use since 1955. It receives discharge from the PUREX Plant chemical sewer line.

DRILLING AND HYDROGEOLOGIC CHARACTERIZATION

Two new wells (299-E25-34 and 299-E25-35) were drilled and constructed at the 216-A-29 ditch this quarter (Figure 21). The wells were essentially completed within this quarter; however, final well development and pump installation were not completed until October 19.

Drilling

The wells were drilled with cable-tool drilling rigs. Temporary drive casing was installed during drilling and was withdrawn while the filter pack and annular seal materials were installed. The final well construction consist of 4-in.-dia 20-slot (0.020-in.) stainless steel screens and flush-joint threaded stainless steel casings. The 20-ft long, 4-in.-dia screens extend approximately 17 ft below and approximately 3 ft above the water table. The screened portions of the completed wells were constructed within nominal 8-in.-dia telescoping screens.

Onsite monitoring was intermittently conducted with both GM and HNU meters for organic vapors and radiation during drilling and construction. No contamination was encountered.

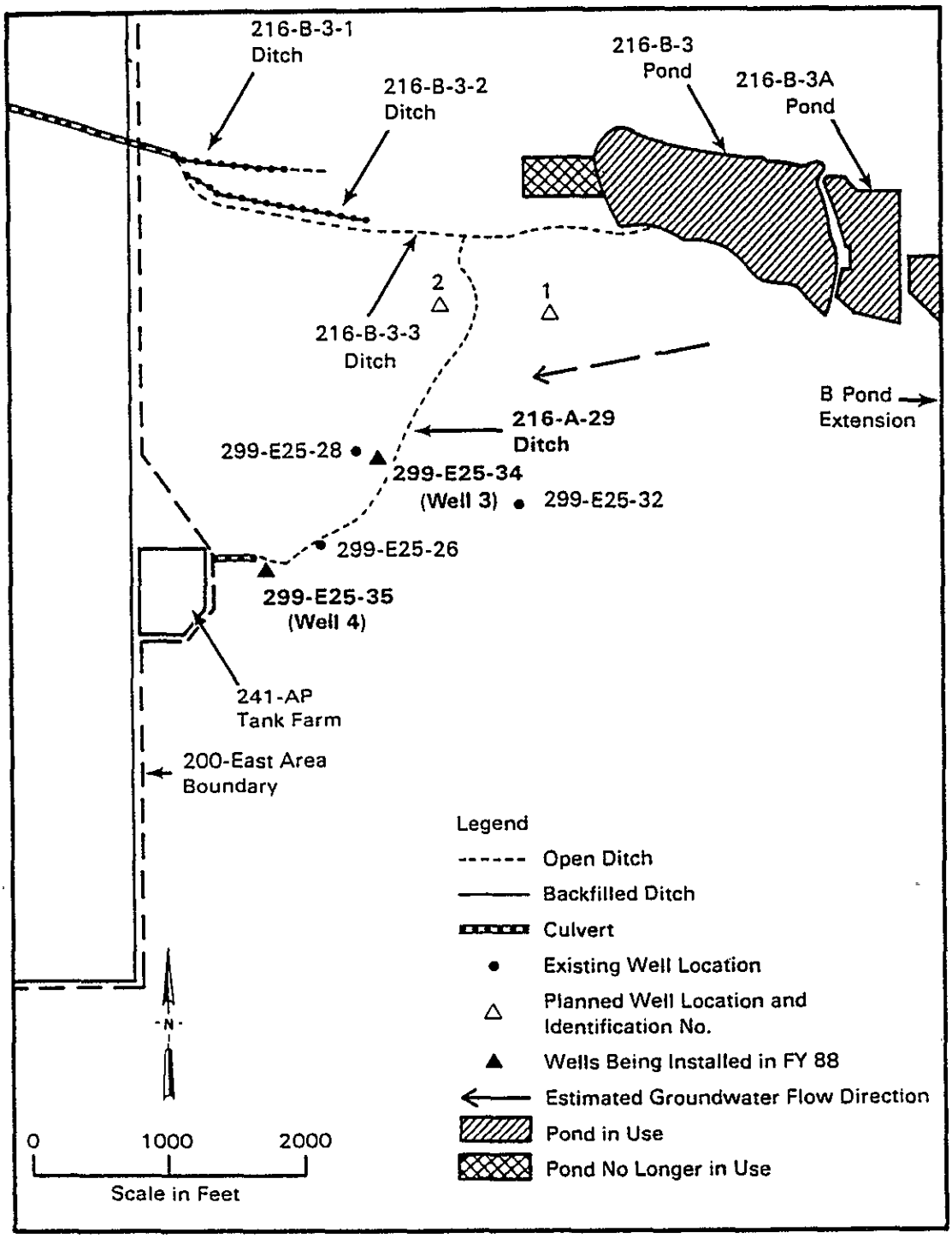

FIGURE 21. Monitoring Well Locations for the 216-A-29 Ditch

A construction summary of each well is provided in Table 31.

Water samples were collected for analysis of selected constituents in accordance with an effluent monitoring plan to determine appropriate disposal methods during well development and aquifer testing. The results of the analyses are given in Table 32.

Hydrogeologic Characterization

The hydrogeologic characterization effort included the collection and field description of geologic samples during drilling, determination of moisture content, and hydrologic testing.

Samples were collected for textural and lithologic description at a minimum of every 5 ft. Moisture content analyses were conducted by PNL on samples collected by drive barrel from intervals in which no water had been added. Borehole geophysical logs (gamma, neutron, and density) were run in each borehole before well construction.

A hydrologic test was conducted in well 299-E25-34 before setting the 4-in. screen and casing. Water was pumped from the well at a rate of approximately 200 gpm, and drawdown was measured in the pumped well and nearby well 299-E25-28. A preliminary "step-development" test was

TABLE 31. Construction Summary for Wells Drilled at the 216-A-29 Ditch

Local Well Number	Start Date	Completion Date(a)	Total Depth Drilled (ft)(b)	Depth to Water (ft)(b)	Screened Interval (ft)(b)
299-E25-34	06-03-88	09-19-88	275	254.5	250.7-270.7
299-E25-35	05-03-88	07-27-88	285	264.0	260.0-281.0

(a) Completion dates indicate when the protective casing, concrete apron, and protective posts were installed.
(b) Depth measurements were made with calibrated steel tapes and/or standardized electric tapes, and are relative to land surface. The values given are not necessarily absolute because of changing reference points during the drilling and construction process.

TABLE 32. Analytical Results of Ground-Water Samples Collected from Wells at the 216-A-29 Ditch Before Well Development and/or Hydrologic Testing

Constituent (unit)	Well Number 299-E25-34	299-E25-35
Total alpha (pCi/L)	1.57 ± .54	17.3 ± 2.9
Total beta (pCi/L)	6.31 ± 2.0	23.2 ± 3.6
Tritium (pCi/L)	1,480 ± 210	64,000 ± 2,510
Cesium-137 (pCi/L)	5.6 ± 2.4	(a)
Volatile organics (ppm)	None detected	None detected

(a) Gamma scan results less than the overall error (2 sigma) are not reported.

conducted before the constant-discharge test to develop the well and to predict the maximum discharge rate and drawdown. The maximum drawdown observed at the end of pumping well 299-E25-34 was approximately 0.83 ft. The drawdown in the observation well (299-E25-28) was approximately 0.03 ft. The duration of the constant-discharge test was approximately 2 h.

Results for the hydrologic test conducted in well 299-E25-35 and reported in the previous quarterly report (PNL 1988d) indicated a transmissivity estimate of approximately 20,000 ft^2/d. A review of the data has revealed that this value is in error and may be at least an order of magnitude greater.

GROUND-WATER SAMPLING AND ANALYSIS

Routine sampling and analysis have not yet begun.

216-A-36B CRIB

S. P. Luttrell

The Washington State Department of Ecology has determined that the 216-A-36B crib requires a RCRA interim-status ground-water monitoring system. Based on the draft of the Ground-Water Monitoring Plan, five new monitoring wells have been installed at the crib. These, combined with the two existing Hanford Site wells near the crib, were sampled for the second time this quarter. Status of the monitoring network and hydrogeologic characterization activities, for this reporting period are presented below.

The 216-A-36B crib is the southern 500-ft section of a 600-ft-long crib (Figure 22). It is 12 ft wide and 12 ft deep, and was separated from the 216-A-36A crib in 1966 by a grout curtain. The 216-A-36B crib received ammonia scrubber distillate from the PUREX Plant from September 1965 to 1972, then was reactivated from November 1982 until October 1987.

DRILLING AND HYDROGEOLOGIC CHARACTERIZATION

No drilling or other hydrogeologic characterization work was performed during the period covered by this report. However, the five new wells were redeveloped before the second quarter's sampling because of high turbidity. The remaining geologist's and driller's logs and well completion/inspection reports not printed last quarter for these well can be found in Appendix A.

Drilling

Each of the five new wells was further developed because turbidity exceeded 5 nephelometric turbidity units (NTU), as indicated in the previous quarterly report (PNL 1988d). The wells were redeveloped by overpumping using a 1.5-hp submersible pump. All purge waters were contained at the well sites for later disposal. Table 33 indicates the beginning and ending turbidity and the total volume pumped from each well during redevelopment.

Hydrogeologic Characterization

Depth-to-water level measurements were made in four of the five new wells and in the two existing wells before sampling. The one new well in

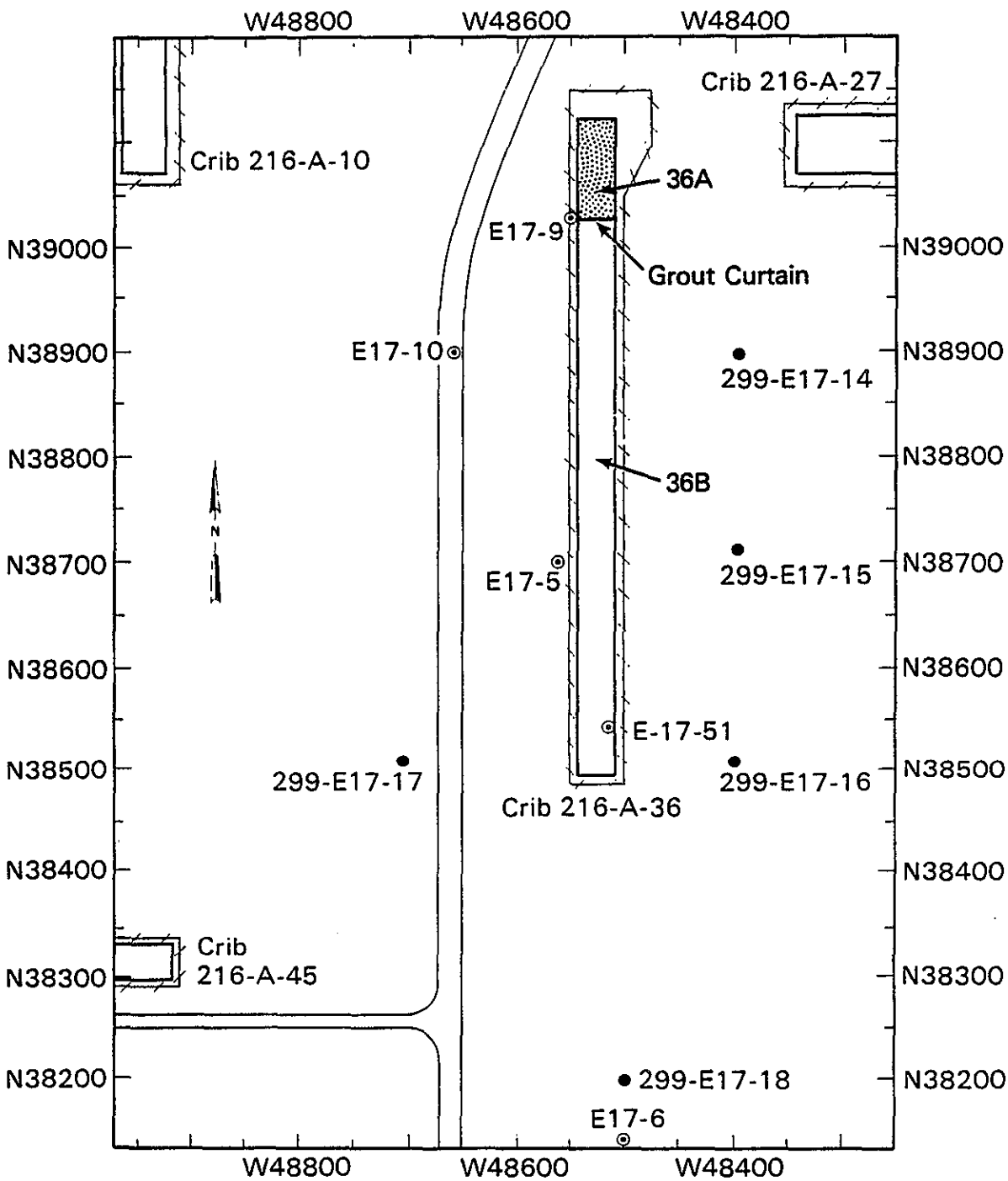

FIGURE 22. Monitoring Well Locations for the 216-A-36B Crib (New locations are indicated by solid bullets.)

TABLE 33. Well Redevelopment Summary

Well Number	Gallons Purged	Initial/Final Turbidity (NTU)	Date
299-E17-14	700	13.0/0.3	6/30/88
299-E17-15	375	23.0/0.3	8/18/88
299-E17-16	400	22.0/0.6	8/19/88
299-E17-17	540	22.0/0.5	8/19/88
299-E17-18	375	4.0/0.5	8/19/88

which depth-to-water was not measured before sampling (299-E17-15) was later measured with some of the other wells. The depth-to-water measurement in another well (299-E17-16) is in question; it was about 10 ft greater than expected. The technician conducting the measurement did not have the historical record and therefore did not realize that the measurement was unusual. The depth to water in this well will be remeasued at the next quarterly sampling. Table 34 shows the depth-to-water level measurements and water-level elevations based on the measurements indicated.

GROUND-WATER SAMPLING AND ANALYSIS

The second quarterly sample set was collected from September 9 through September 14, 1988. The sample analyses were not complete as of September 30 for inclusion in this report.

TABLE 34. Surveyed Elevations of Well Casings, and Water-Level Measurements and Elevations Around the 216-A-36B Crib

Well Number	Casing Elevation (ft above MSL)	Date of Measurement	Depth to Water (ft)	Water-Level Elevation (ft above MSL)
299-E17-5	718.69	09-09-88	313.85[a]	404.84
299-E17-6	720.10	09-09-88	314.40	405.70
		09-30-88	314.27	405.83
299-E17-14	722.18	09-09-88	316.65	405.53
299-E17-15	721.78	09-14-88	(b)	(b)
		09-30-88	316.75	405.03
299-E17-16	720.58	09-14-88	324.42	396.16[c]
299-E17-17	719.92	09-13-88	314.15	405.77
		09-30-88	314.19	405.73
299-E17-18	720.65	09-13-88	314.95	405.70
		09-30-88	314.87	405.78

(a) Recorded on field record form as 113.85.
(b) Not measured.
(c) Anomalous value. May indicate a measurement or recording error.

216-B-3 POND

S. P. Luttrell

A RCRA Part A interim-status permit application has been submitted for the 216-B-3 Pond (hereafter called B Pond). B Pond is also proposed for closure under RCRA, although it will continue to receive non-RCRA-regulated waste water. Based on the draft of the Ground-Water Monitoring Plan, four new wells were installed at B Pond in 1988 to provide the pond with a detection-level ground-water monitoring system. Activities conducted this quarter include drilling, aquifer testing, and completing the four new wells.

B Pond is actually a series of interconnected ponds covering 39 acres to the east of the 200-East Area (Figure 23). The pond receives large volumes of waste water from facilities in the 200-East Area.

DRILLING AND HYDROGEOLOGIC CHARACTERIZATION

Four new wells (temporarily named BP-3, BP-7, BP-8, and BP-10) were drilled and constructed at B Pond this quarter (Figure 23). The wells were essentially completed within this quarter; however, final well development and pump installation were not completed until October 24.

Drilling

The wells were drilled with cable-tool drilling rigs. Temporary drive casing was installed during drilling and was withdrawn while the filter pack and annular seal materials were installed. Wells BP-3 and BP-8 are constructed with 4-in.-dia 10-slot (0.010-in.) stainless steel screens and flush-joint threaded stainless steel casings. The 20-ft-long screens in these wells extend approximately 18 ft below and approximately 2 ft above the water table. The screened portions of these completed wells were constructed within nominal 8-in.-dia telescoping screens, which were placed in the wells to set a pump for hydrologic testing.

Well BP-7 is constructed with 4-in.-dia 5-slot (0.005-in.) stainless steel screen that extends approximately 20 ft below the water table. Telescoping screen was not set in this well before construction.

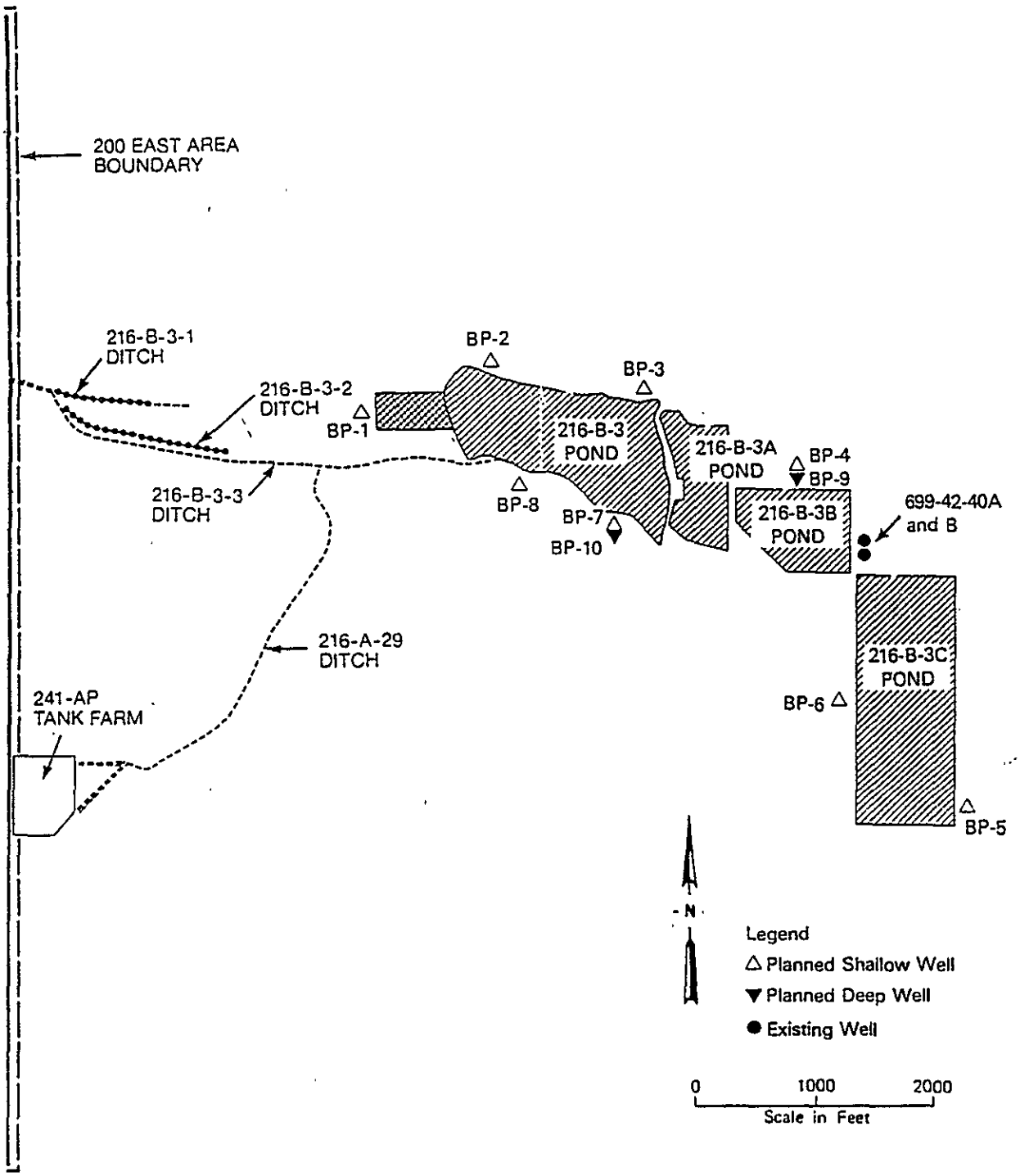

FIGURE 23. Monitoring Well Locations for the 216-B-3 Pond

Well BP-10 is constructed with 4-in.-dia 10-slot (0.010-in.) stainless steel screen and flush-joint threaded stainless steel casing. The bottom of the 10-ft long screen is at a depth of approximately 203 ft immediately above a sandy silty clay unit.

Onsite monitoring was intermittently conducted with both HNU and GM meters for organic vapors and radiation during drilling and construction. No contamination was encountered.

Table 35 summarizes construction information for the wells.

Water samples were collected for analysis of selected constituents in accordance with an effluent monitoring plan to determine appropriate disposal methods during well development and aquifer testing. The results of the analyses are given in Table 36.

Hydrogeologic Characterization

The hydrogeologic characterization effort included the collection and field description of geologic samples during drilling, determinations of moisture content, and hydrologic testing.

TABLE 35. Construction Summary for Wells Drilled at the 216-B-3 Pond

Local Well Number	Start Date	Completion Date	Total Depth Drilled (ft)(b)	Depth to Water (ft)(b)	Screened Interval (ft)(b)	Aquifer Test (?)
BP-3	09-06-88	09-30-88	173	153.4	151.6-171.6	Yes
BP-7	07-22-88	09-02-88	180	157.1	157.4-177.4	No
BP-8	08-02-88	09-30-88	180	159.3	197.5-177.5	Yes
BP-10	08-15-88	10-04-88	250	160.8	182.5-202.5	Yes

(a) Completion dates indicate when the protective casing, concrete apron, and protective posts were installed.
(b) Depth measurements were made with calibrated steel tapes and/or standardized electric tapes, and are relative to land surface. The values given are not necessarily absolute because of changing reference points during the drilling and construction process.

TABLE 36. Analytical Results of Ground-Water Samples Collected from Wells at the 216-B-3 Pond Before Well Development and/or Hydrologic Testing

Constituent (unit)	Well Number BP-3	BP-7	BP-8	BP-10
Total alpha (pCi/L)	1.41 ± 0.55	1.99 ± 0.62	(a)	2.29 ± 0.67
Total beta (pCi/L)	10.1 ± 2.5	6.25 ± 1.8	4.94 ± 1.9	5.51 ± 1.9
Iodine-129 (pCi/L)	1.93 ± 0.38	2.43 ± 0.15	2.48 ± 1.4	4.30 ± 0.94
Total organic carbon (ppm)	1.52	0.97	0.97	1.44

(a) Result was less than the overall error. Also, gamma scan results were less than the overall error (2 sigma) and are therefore not reported.

Split-spoon samples were collected while drilling well BP-10 through approximately 18 ft of sandy silty clay that was encountered at a depth of approximately 160 ft in this well and in well BP-7.

Samples were collected for textural and lithologic description at a minimum of every 5 ft. Moisture content analyses were conducted by PNL on samples collected by drive barrel from intervals in which no water had been added. Borehole geophysical logs (gamma, neutron, and density) were run in each borehole before well construction, with the exception of well BP-3, in which only the gamma log was run.

Hydrologic tests were conducted in wells BP-3, BP-8, and BP-10 before setting the 4-in. screens and casings. Preliminary "step-development" tests were conducted before the constant-discharge tests to develop the wells and to predict the maximum discharge rates and drawdowns. Single-well tests were conducted in BP-3 and BP-8 because there are no nearby wells in which to measure responses. Well BP-7 was used as an observation well when BP-10 was pumped.

Well BP-3 was pumped at a rate of approximately 215 gpm for a duration of approximately 7 h. Well BP-8 was pumped at a rate of approximately 215 gpm for a duration of approximately 5 h. Well BP-10 was pumped at a

rate of approximately 5 gpm for approximately 80 min; however, the pump began to have problems after about 30 min. The test will be conducted again before setting the sampling pump when the well is completed. Maximum drawdown observed at the end of pumping was approximately 1.9 ft for well BP-3, 0.45 ft for well BP-3, and 11.7 ft for well BP-10.

GROUND-WATER SAMPLING AND ANALYSIS

Sampling and analysis have not yet begun.

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2101-M POND

M. A. Chamness

This section discusses the status of activities and observations to date with regard to drilling and constructing ground-water monitoring wells, conducting hydrogeologic characterization, and sampling and analyzing the ground water at the 2101-M Pond interim-status detection-level ground-water monitoring project.

DRILLING AND HYDROGEOLOGIC CHARACTERIZATION

Four new wells were drilled and constructed at the 2101-M Pond (Figure 24). The new wells (299-E18-1, 299-E18-2, 299-E18-3, and 299-E18-4) are discussed below. The wells were completed, aquifer tests performed, and sampling pumps installed by August 15. The first set of quarterly ground-water samples was collected on August 16.

Drilling

The wells were drilled with cable-tool drilling rigs, using both core-barrel and hard-tool drilling methods. Temporary drive casing was installed during drilling and was withdrawn while the filter pack and annular seal materials were installed. The final wells consist of 4-in.-dia 20-slot (0.020-in.) stainless steel screens and casings. The 20-ft long 4-in.-dia screens extend approximately 18 ft below the water table. The screened portions of the completed wells were constructed within a 10-slot 8-in. telescoping screen. Telescoping screens were to be used for aquifer tests and to minimize entry of fine-grained sediments into the completed well. Before completion, each well was geophysically logged with natural gamma, density, and neutron probes.

Sediment samples were collected every 5 ft and at major changes in lithology. Moisture content analyses were made on every sample taken with a core-barrel where water was not added. Moisture content of the sediments is given in Appendix B as a part of the lithologic logs. Sediment samples were also taken at selected intervals for analysis of volatile organic chemicals

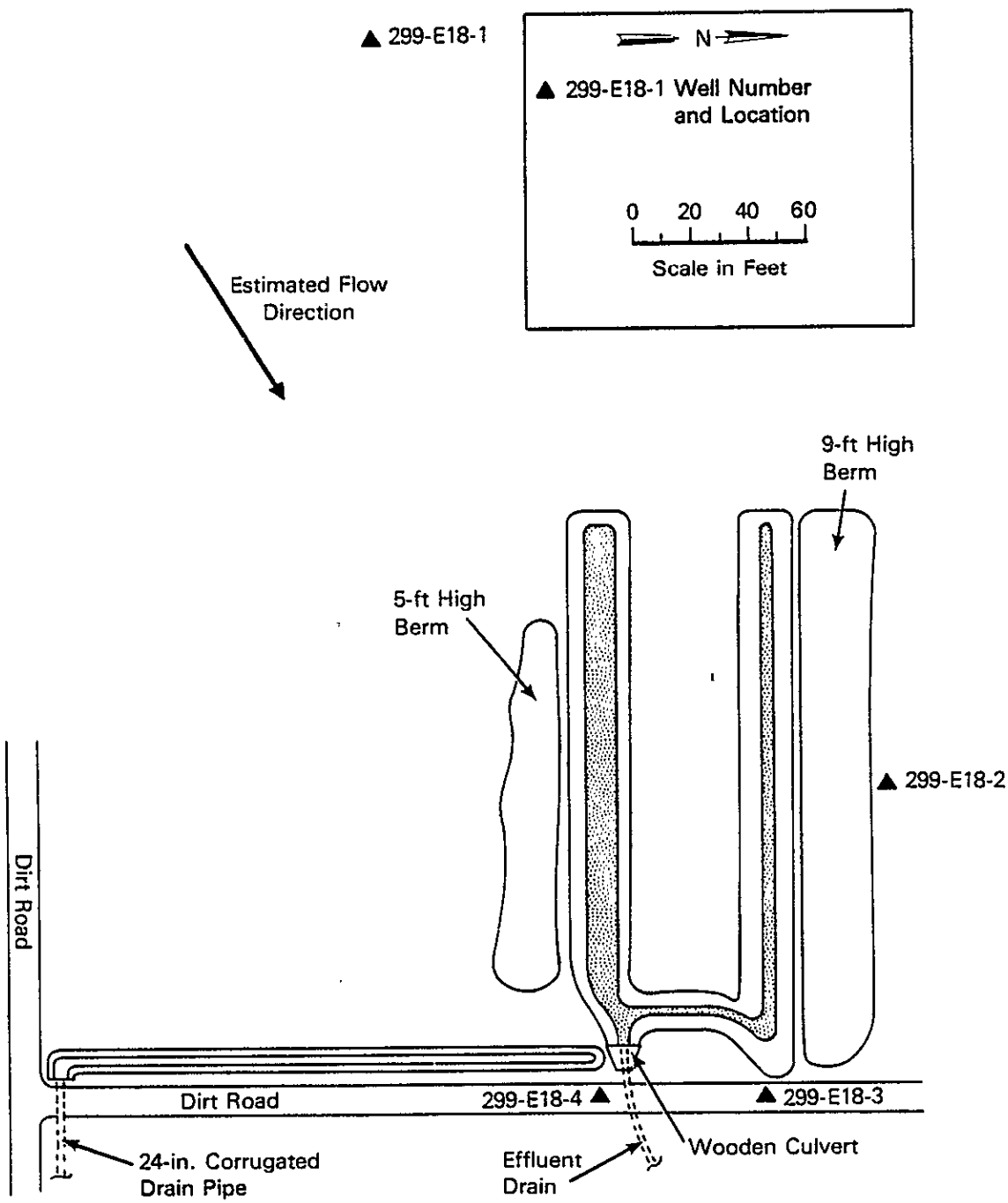

FIGURE 24. Monitoring Locations at the 2101-M Pond

and metals. These samples were analyzed by UST and PNL. The results of these samples are currently being analyzed and reviewed.

Radiation protection technicians surveyed all of the sediment samples for radiological contamination. None was detected. Each wellhead was checked periodically with a photoionization meter, and no organic vapors were detected.

The new wells were developed by bailing and overpumping. The wells were developed to a turbidity of less than 5 NTU and less than 8 mg of sediment per liter of water. Approximately 1800 gal were pumped from each well to meet turbidity requirements during development. After development, HydroStar sampling pumps were installed.

The status of each well and observations concerning the installation and completion of the wells are indicated below. Driller's logs, geologists's logs, geophysical logs, as-built summary diagrams, and inspection report forms are presented in Appendix B.

Well 299-E18-1

During this quarter, the well was drilled from a depth of 306 ft to its final depth of 332 ft, the well was completed, a concrete pad was poured, and guardposts were installed.

Depth to water is approximately 309.7 ft below the ground surface. The 4-in.-dia screen extends from 308.5 to 329 ft. The well was surveyed on August 3, and the elevation and Hanford coordinates are given on the inspection report form for this well (see Appendix B).

Analysis of the ground water for possible contaminants indicated that the water could be discharged to the ground. Consequently, an aquifer test was performed on August 3 using a 1.5-hp pump. Approximately 8000 gal of water were pumped from the well during the step-drawdown and constant-discharge tests. Data from the aquifer test are currently being analyzed and reviewed. The well was developed, and the sampling pump was installed by August 12. Samples were taken on August 16. Results of analyses performed on the ground-water samples are presented in Tables 37 and 38.

TABLE 37. Summary of Sampling Results for the 2101-M Pond, August 1988

Constituent List=Contamination Indicator Parameters

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standard	Standards Agency	Exceeded	Full name
088	CONDLAB	umho	.	16	0		700	WDOE		Specific conductance, laboratory
191	CONDFLD	umho	1	16	0		700	WDOE	xxx	Specific conductance, field
199	PHFIELD		0.1	16	0		6.5-8.5	EPAS		pH, field
207	PH-LAB		0.01	16	0		6.5-8.5	EPAS		pH, laboratory
C69	TOC	ppb	1000	16	0		.			Total organic carbon
H42	TOXLDL	ppb	20	16	0		.			Total organic halogens, low DL

Constituent List=Drinking Water Parameters

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standard	Standards Agency	Exceeded	Full name
109	COLIFRM	MPN	2.2	4	4	***	1	EPA		Coliform bacteria
111	BETA	pCi/L	8	4	0		50	EPA		Gross beta
181	RADIUM	pCi/L	1	4	0		5	EPA		Total radium
212	ALPHA	pCi/L	4	4	0		15	EPA		Gross alpha
A06	BARIUM	ppb	6	4	0		1000	EPA		Barium
A07	CADMIUM	ppb	2	4	4	***	10	EPA		Cadmium
A08	CHROMUM	ppb	10	4	0		50	EPA	xxx	Chromium
A10	SILVER	ppb	10	4	4	***	50	EPA		Silver
A20	ARSENIC	ppb	5	4	1		50	EPA	xxx	Arsenic
A21	MERCURY	ppb	0.1	4	4	***	2	EPA		Mercury
A22	SELENUM	ppb	5	4	1		10	EPA	xxx	Selenium
A33	ENDRIN	ppb	0.1	4	4	***	0.2	EPA		Endrin
A34	METHLOR	ppb	3	4	4	***	100	EPA		Methoxychlor
A35	TOXAENE	ppb	1	4	4	***	5	EPA		Toxaphene
A36	a-BHC	ppb	0.1	4	4	***	4	EPA		Alpha-BHC
A37	b-BHC	ppb	0.1	4	4	***	4	EPA		Beta-BHC
A38	g-BHC	ppb	0.1	4	4	***	4	EPA		Gamma-BHC
A39	d-BHC	ppb	0.1	4	4	***	4	EPA		Delta-BHC
A51	LEADGF	ppb	5	4	3		50	EPA		Lead (graphite furnace)
C72	NITRATE	ppb	500	4	3		45000	EPA		Nitrate
C74	FLUORID	ppb	500	4	3		4000	EPA		Fluoride
H13	2,4-D	ppb	2	4	4	***	100	EPA		2,4-D [2,4-Dichlorophenoxyacetic acid]
H14	2,4,5TP	ppb	2	4	4	***	10	EPA		2,4,5-TP silvex
H20	FBARIUM	ppb	6	4	0		1000	EPA		Barium, filtered
H21	FCADMIU	ppb	2	4	4	***	10	EPA		Cadmium, filtered
H22	FCHROMI	ppb	10	4	4	***	50	EPA		Chromium, filtered
H23	FSILVER	ppb	10	4	4	***	50	EPA		Silver, filtered
H37	FARSENI	ppb	5	4	1		50	EPA		Arsenic, filtered
H38	FMERCUR	ppb	0.1	4	4	***	2	EPA		Mercury, filtered
H39	FSELENI	ppb	5	4	2		10	EPA	xxx	Selenium, filtered
H41	FLEAD	ppb	5	4	4	***	50	EPA		Lead, filtered

TABLE 37. (contd)

Constituent List=Water Quality Parameters

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standards Standard	Agency	Exceeded	Full name
A11	SODIUM	ppb	200	4	0		.			Sodium
A17	MANGESE	ppb	5	4	0		50	EPAS	xxx	Manganese
A19	IRON	ppb	30	4	0		300	EPAS	xxx	Iron
C73	SULFATE	ppb	500	4	0		250000	EPAS		Sulfate
C75	CHLORID	ppb	500	4	0		250000	EPAS		Chloride
H24	FSODIUM	ppb	200	4	0		.			Sodium, filtered
H29	FMANGAN	ppb	5	4	2		50	EPAS	xxx	Manganese, filtered
H31	FIRON	ppb	30	4	0		300	EPAS		Iron, filtered
H57	LPHENOL	ppb	10	4	4	***	.			Phenol, low DL

Constituent List=Site Specific and Other Parameters

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Standards Standard	Agency	Exceeded	Full name
A01	BERYLUM	ppb	5	4	4	***	.			Beryllium
A03	STRONUM	ppb	20	4	0		.			Strontium
A04	ZINC	ppb	5	4	1		5000	EPAS		Zinc
A05	CALCIUM	ppb	50	4	0		.			Calcium
A12	NICKEL	ppb	10	4	0		.			Nickel
A13	COPPER	ppb	10	4	4	***	1300	EPAP		Copper
A14	VANADUM	ppb	5	4	1		.			Vanadium
A15	ANTIONY	ppb	100	4	4	***	.			Antimony
A16	ALUMNUM	ppb	150	4	3		.			Aluminum
A18	POTASUM	ppb	100	4	0		.			Potassium
A50	MAGNES	ppb	50	4	0		.			Magnesium
C76	PHOSPHA	ppb	1000	4	4	***	.			Phosphate
H18	FZINC	ppb	5	4	2		5000	EPAS		Zinc, filtered
H19	FCALCIU	ppb	50	4	0		.			Calcium, filtered
H25	FNICKEL	ppb	10	4	3		.			Nickel, filtered
H26	FCOPPER	ppb	10	4	4	***	1300	EPAP		Copper, filtered
H27	FVANADI	ppb	5	4	1		.			Vanadium, filtered
H28	FALUMIN	ppb	150	4	4	***	.			Aluminum, filtered
H30	FPOTASS	ppb	100	4	0		.			Potassium, filtered
H32	FMAGNES	ppb	50	4	0		.			Magnesium, filtered
H33	FBERYLL	ppb	5	4	4	***	.			Beryllium, filtered
H35	FSTRONT	ppb	20	4	0		.			Strontium, filtered
H36	FANTIMO	ppb	100	4	4	***	.			Antimony, filtered

*** - Indicates all samples were reported as below contractual detection limits
xxx - Indicates that Drinking Water Standards were exceeded
EPA - based on Maximum Contaminant Levels given in 40 CFR Part 141 (July,1987) National Primary Drinking Water Regulations as amended by 52 FR 25690
EPAR - based on National Interim Primary Drinking Water Regulations, Appendix IV, EPA-570/9-76-003
EPAP - based on proposed Maximum Contaminant Level Goals in 50 FR 46936
EPAS - based on Secondary Maximum Contaminant Levels given in 40 CFR Part 143 National Secondary Drinking Water Regulations
WDOE - based on additional Secondary Maximum Contaminant Levels given in WAC 248-54, Public Water Supplies

TABLE 38. Constituents with at Least One Detected Value for the 2101-M Pond, Quarterly Sampling, August 1988

Quadruplicate Contamination Indicator Parameters

Well name	Collection Date	Duplicate sample number	CONDFLD umho 1/700w	CONDLAB umho ./700w	PH-LAB 0.01/8.5s	PHFIELD 0.1/8.5s	TOC ppb 1000/.	TOXLDL ppb 20/.
2-E18-1	16AUG88		812	534	7.9	7.8	#532	#1.3
		1	812	531	7.9	7.8	#890	#11.5
		2	811	529	7.9	7.9	#382	#11.4
		3	809	521	7.9	7.8	#397	#-4.8
2-E18-2	16AUG88		352	251	8.0	7.9	#341	#-4.7
		1	354	249	8.0	7.9	#356	#-0.9
		2	355	249	8.0	7.9	#717	#-1.8
		3	355	248	8.0	7.9	#543	#9.9
2-E18-3	16AUG88		279	200	8.0	7.9	#546	#2.9
		1	279	200	8.0	7.9	#531	#13.7
		2	280	204	8.0	7.9	#498	37.2
		3	280	204	8.0	7.9	#492	#5.1
2-E18-4	16AUG88		303	219	8.0	7.8	#453	#0.9
		1	303	220	8.0	7.9	#503	#7.7
		2	303	219	8.0	8.0	#440	#-3.2
		3	303	218	8.0	8.0	#642	#12.7

The column headers consist of : Constituent Name
Analysis Units
Contractual Detection Limit/Drinking Water Standard(suffix)

Suffix
none - based on Maximum Contaminant Levels given in 40 CFR Part 141 (July,1987) National Primary Drinking Water Regulations as amended by 52 FR 25690
r - based on National Interim Primary Drinking Water Regulations, Appendix IV, EPA-570/9-76-003
p - based on proposed Maximum Contaminant Level Goals in 50 FR 46936
s - based on Secondary Maximum Contaminant Levels given in 40 CFR Part 143 (July, 1987) National Secondary Drinking Water Regulations
w - based on additional Secondary Maximum Contaminant Levels given in WAC 248-54, Public Water Supplies

Data flags
< - Less than Contractual Detection Limit, reported as Limit
- Less than Contractual Detection Limit, measured value reported
* - For radioactive constituents, reported value is less than 2-sigma error

TABLE 38. (contd)

Well name	Collection Date	Duplicate sample number	ALPHA pCi/L 4/15	ALUMNUM ppb 150/.	ARSENIC ppb 5/50	FARSENI ppb 5/50	BARIUM ppb 6/1000	FBARIUM ppb 6/1000	BETA pCi/L 8/50	FCALCIU ppb 50/.	CALCIUM ppb 50/.
2-E18-1	16AUG88		2.210	351	<5	<5	41	41	3.89	70,800	57,300
2-E18-2	16AUG88		0.416	<150	5	5	49	53	*1.13	25,700	22,900
2-E18-3	16AUG88		*0.352	<150	51	12	50	52	1.87	26,800	24,800
2-E18-4	16AUG88		0.917	<150	11	9	49	52	2.05	30,700	27,500

Well name	Collection Date	Duplicate sample number	CHLORID ppb 500/250000s	CHROMUM ppb 10/50	FLUORID ppb 500/4000	IRON ppb 30/300s	FIRON ppb 30/300s	LEADGF ppb 5/50	MAGNES ppb 50/.	FMAGNES ppb 50/.	FMANGAN ppb 5/50s
2-E18-1	16AUG88		6,550	30	<500	1250	33	<5.0	15,300	17,100	51
2-E18-2	16AUG88		2,060	30	575	250	39	<5.0	6,750	7,340	<5
2-E18-3	16AUG88		4,470	62	<500	983	40	<5.0	7,170	7,550	<5
2-E18-4	16AUG88		6,260	54	<500	493	67	9.5	7,810	8,340	8

Well name	Collection Date	Duplicate sample number	MANGESE ppb 5/50s	NICKEL ppb 10/.	FNICKEL ppb 10/.	NITRATE ppb 500/45000	FPOTASS ppb 100/.	POTASUM ppb 100/.	RADIUM pCi/L 1/5	FSELENI ppb 5/10	SELENUM ppb 5/10
2-E18-1	16AUG88		70	15	<10	10,100	6,980	6,350	2.150	10.7	14.9
2-E18-2	16AUG88		6	16	<10	<500	5,280	4,920	1.240	7.0	8.9
2-E18-3	16AUG88		15	31	<10	<500	5,030	4,860	0.701	<5.0	48.6
2-E18-4	16AUG88		13	34	13	<500	5,580	5,250	0.753	<5.0	<5.0

Well name	Collection Date	Duplicate sample number	SODIUM ppb 200/.	FSODIUM ppb 200/.	FSTRONT ppb 20/.	STRONUM ppb 20/.	SULFATE ppb 500/250000s	FVANADI ppb 5/.	VANADUM ppb 5/.	ZINC ppb 5/5000s	FZINC ppb 5/5000s
2-E18-1	16AUG88		28,700	31,500	277	249	168,000	<5	<5	181	145
2-E18-2	16AUG88		18,000	19,700	145	133	23,500	13	15	<5	<5
2-E18-3	16AUG88		5,570	5,480	138	128	13,000	21	23	64	23
2-E18-4	16AUG88		6,010	6,310	163	146	13,500	19	20	21	<5

Well 299-E18-2

During this quarter, the well was completed, a concrete pad was poured, and guardposts were installed. The well was developed and used as an observation well during the aquifer tests in well 299-E18-3. Depth to water is approximately 312.5 ft below the ground surface. The well was surveyed on August 3, and the elevation and Hanford Plant coordinates are given on the inspection report form for this well (see Appendix B). The well was developed, and the sampling pump was installed by August 13. Samples were taken August 16. Results of the ground-water sampling are presented in Tables 37 and 38.

Well 299-E18-3

During this quarter, the well was completed, a concrete pad was poured, and guardposts were installed. Problems with heaving sand at the bottom of the borehole required overdrilling and addition of silica sand to help stabilize the bottom of the hole. Depth to water is approximately 311.4 ft below the ground surface. The well was surveyed on August 3, and the elevation and Hanford Plant coordinates are given on the inspection report form for this well (see Appendix B).

Initial ground-water analyses indicated that aquifer test water could be discharged to the ground. Several aquifer tests were attempted in this well using 40-, 25-, 5-, and 1.5-hp submersible pumps. Drawdown was excessive with the first two pumps. The 5-hp pump provided the best data. Overall, approximately 14,200 gal of water were pumped from this well during the step-drawdown and constant-discharge tests. These data are currently being analyzed and reviewed. The well was developed, and the sampling pump was installed by August 13. Samples were taken on August 16. Results of the ground-water sampling are given in Tables 37 and 38.

Well 299-E18-4

During this quarter, the well was completed, a concrete pad was poured, and guardposts were installed. The well was developed and used as an observation well during the aquifer tests on well 299-E18-3. Depth to water is approximately 312.4 ft below the ground surface. The well was surveyed on

August 3, and the elevation and Hanford Plant coordinates are given on the inspection report form for this well (see Appendix B). A HydroStar sampling pump was installed on August 13, and samples were taken on August 16. The results of the ground-water sampling are given in Tables 37 and 38.

Hydrogeologic Characterization

The hydrogeologic characterization effort included the collection and field description of geologic samples during drilling, moisture content analyses, field measurements of sediment pH, analysis for volatile organics and metals in selected sediment samples, hydrologic testing, water-chemistry analyses to determine locations for ground water discharges during development and aquifer tests, ground-water sampling, and water-level measurements before completion of the wells. The geologist's and driller's logs are provided in Appendix B. The geologist's logs include the pH and moisture content data.

At the surface of the site, the sediments consist of sand to sandy gravel. Below this and to a depth of between 215 and 240 ft is a unit of primarily sand with minor silt and gravel. Thin silty layers occur occasionally throughout this unit. Below this sand and extending to the bottom of the boreholes is a silty sandy gravel.

Hydrologic tests were conducted in wells 299-E18-1 and 299-E18-3. During the pumping and recovery portions of the tests on well 299-E18-3, both well 299-E18-2 and 299-E18-4 were used as observation wells. Initially, a 40-hp pump was installed in well 299-E18-3 for the step-drawdown test. The rate of discharge was too high with this pump and could not be reduced using an in-line valve. A 25-hp pump was then installed, but again the discharge rate was too high and could not be reduced with the in-line valve. These two tests were both conducted inside an 8-in. 10-slot telescoping screen before the completion of the pumping wells. Because of the problems with the aquifer tests in well 299-E18-3, it was decided to use the 1.5-hp pump used for development of the wells as the aquifer test pump after completion of the wells. A discharge rate of approximately 17 gpm was reached, which caused drawdown in the pumping well but none in the observation wells. It was decided to use a 5-hp pump in well 299-E18-3 to increase the discharge rate

enough to be able to see some response in the observation wells. A discharge rate of approximately 35 gpm was achieved with the 5-hp pump. Data from these tests, as well as the test using a 1.5-hp pump at well 299-E18-1, are still being analyzed and reviewed.

SEDIMENT SAMPLING AND ANALYSIS

Seven sediment samples were taken during drilling. The methods used are discussed below. The results of the analyses are still being analyzed and reviewed.

Collection and Analysis

Two wells were sampled, with six samples taken from well 299-E18-3 at various depths because of its proximity to the pond, and one sample as a background sample from well 299-E18-1. Samples were generally taken from fine-grained layers interfingered with coarser-grained sediments, based on the premise that finer-grained sediments will slow water movement through the vadose zone as well as provide a place for any contaminants to sorb. All of the samples were analyzed for metals (using XRF) and for volatile organics.

Samples from well 299-E18-3 were taken at depths of 45, 62, 84, 97, and 194 ft, with the latter being split into two samples. The sample from well 299-E18-1 was taken at a depth of 195 ft.

GROUND-WATER SAMPLING AND ANALYSIS

Only one set of quarterly samples have been taken to date, as required in 40 CFR 265.92. The sampling and results are discussed below.

Collection and Analysis

Samples from each of the newly installed monitoring wells were taken on August 16 after approximately three borehole volumes of water had been purged from the well. The analyses on these samples were performed in 10 working days, providing the results by the end of August. Water-level measurements were not made at the time of sampling because the sampling technicians were unfamiliar with the wellhead design.

A summary of the analytical data from the wells is provided in Table 37. The data for constituents that had at least one value reported above the detection limit are presented in Table 38. The samples from wells 299-E18-2 and 299-E18-4 may be questionable with respect to their representativeness of ground-water conditions, as discussed below and in the next section.

Well 299-E18-1

The sample was taken after well purging. There were apparently no problems with turbidity or the functioning of the pump. The sample is thought to be representative of the ground water.

Well 299-E18-2

The sample was taken after well purging. There were no recorded problems with turbidity or functioning of the pump. This sample may be representative of the ground water.

Well 299-E18-3

The sample was taken after well purging. There were no recorded problems with turbidity or functioning of the pump. This sample is thought to be representative of the ground water.

Well 299-E18-4

The sample was taken after well purging. There were no recorded problems with turbidity, although the pump had a relatively slow discharge rate. This sample may be representative of the ground water.

Discussion of Results

The analytical results in Table 37 show that some unfiltered and filtered samples exceed the drinking water standards for several constituents. Well 299-E18-1 shows unfiltered iron, manganese, and selenium, as well as filtered manganese and selenium that are above drinking water standards. Well 299-E18-2 shows no constituents above drinking water standards. Because neither well 299-E18-2 nor well 299-E18-4 had aquifer tests, there is the possibility that not all of the drilling water has been purged from the surrounding aquifer yet. Well 299-E18-3 shows unfiltered arsenic, chromium, iron, and selenium above drinking water standards. Well 299-E18-4 shows

unfiltered chromium and iron above drinking water standards. Drinking water standards for manganese and iron are from the Secondary Maximum Contaminant Levels given in 40 CFR 143 (July 1987), National Secondary Drinking Water Regulations.

Because of the levels of selenium, chromium, arsenic, and manganese above drinking water standards in both filtered and unfiltered samples, it was decided to sample all four wells again for those constituents. The results for the second set of samples, presented in Table 39, indicate that all four wells showed unfiltered levels of chromium and iron above drinking water standard, and that well 299-E18-1 showed unfiltered selenium at the drinking water standards of 10 ppb. None of the filtered samples from the resampling effort showed levels of any constituent above drinking water standards.

TABLE 39. Constituents Resampled at the 2101-M Pond, August 1988

Standard List Constituents

Well name	Sample Date	Dup num	FALUMIN ppb 150/.	ALUMNUM ppb 150/.	ARSENIC ppb 5/50	FARSENI ppb 5/50	BARIUM ppb 6/1000	FBARIUM ppb 6/1000	FCADMIU ppb 2/10	CADMIUM ppb 2/10	FCALCIU ppb 50/.
2-E18-1	22SEP88		D	609	D	D	54	48	D	D	73700
2-E18-2	22SEP88		D	D	5	5	54	52	D	D	25600
2-E18-3	22SEP88		D	D	11	12	61	59	D	D	31000
2-E18-4	22SEP88		D	173	9	8	58	55	D	D	31300

Well name	Sample Date	Dup num	CALCIUM ppb 50/.	FCHROMI ppb 10/50	CHROMUM ppb 10/50	COPPER ppb 10/1300p	FCOPPER ppb 10/1300p	IRON ppb 30/300s	FIRON ppb 30/300s	MAGNES ppb 50/.
2-E18-1	22SEP88		72800	D	104	D	D	1810	D	17000
2-E18-2	22SEP88		25400	D	87	D	D	535	D	6790
2-E18-3	22SEP88		29600	D	67	D	D	1440	32	7900
2-E18-4	22SEP88		31000	D	159	D	D	1580	68	8070

Well name	Sample Date	Dup num	FMAGNES ppb 50/.	FMANGAN ppb 5/50s	MANGESE ppb 5/50s	NICKEL ppb 10/.	FNICKEL ppb 10/.	FPOTASS ppb 100/.	POTASUM ppb 100/.	FSELENI ppb 5/10	SELENUM ppb 5/10
2-E18-1	22SEP88		16500	19	46	48	D	6870	7200	8.6	10
2-E18-2	22SEP88		6710	D	13	43	D	4930	5090	D	D
2-E18-3	22SEP88		8080	D	22	35	D	5220	5140	D	D
2-E18-4	22SEP88		8060	11	32	79	16	5570	5640	D	D

Well name	Sample Date	Dup num	SILVER ppb 10/50	FSILVER ppb 10/50	SODIUM ppb 200/.	FSODIUM ppb 200/.	FVANADI ppb 5/.	VANADUM ppb 5/.	ZINC ppb 5/5000s	FZINC ppb 5/5000s
2-E18-1	22SEP88		D	D	28800	27400	D	5	73	46
2-E18-2	22SEP88		D	D	17700	17300	18	19	D	D
2-E18-3	32SEP88		D	D	5310	5360	27	26	34	D
2-E18-4	22SEP88		D	D	6760	6680	19	22	10	D

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